# DIESEL PROGRESS

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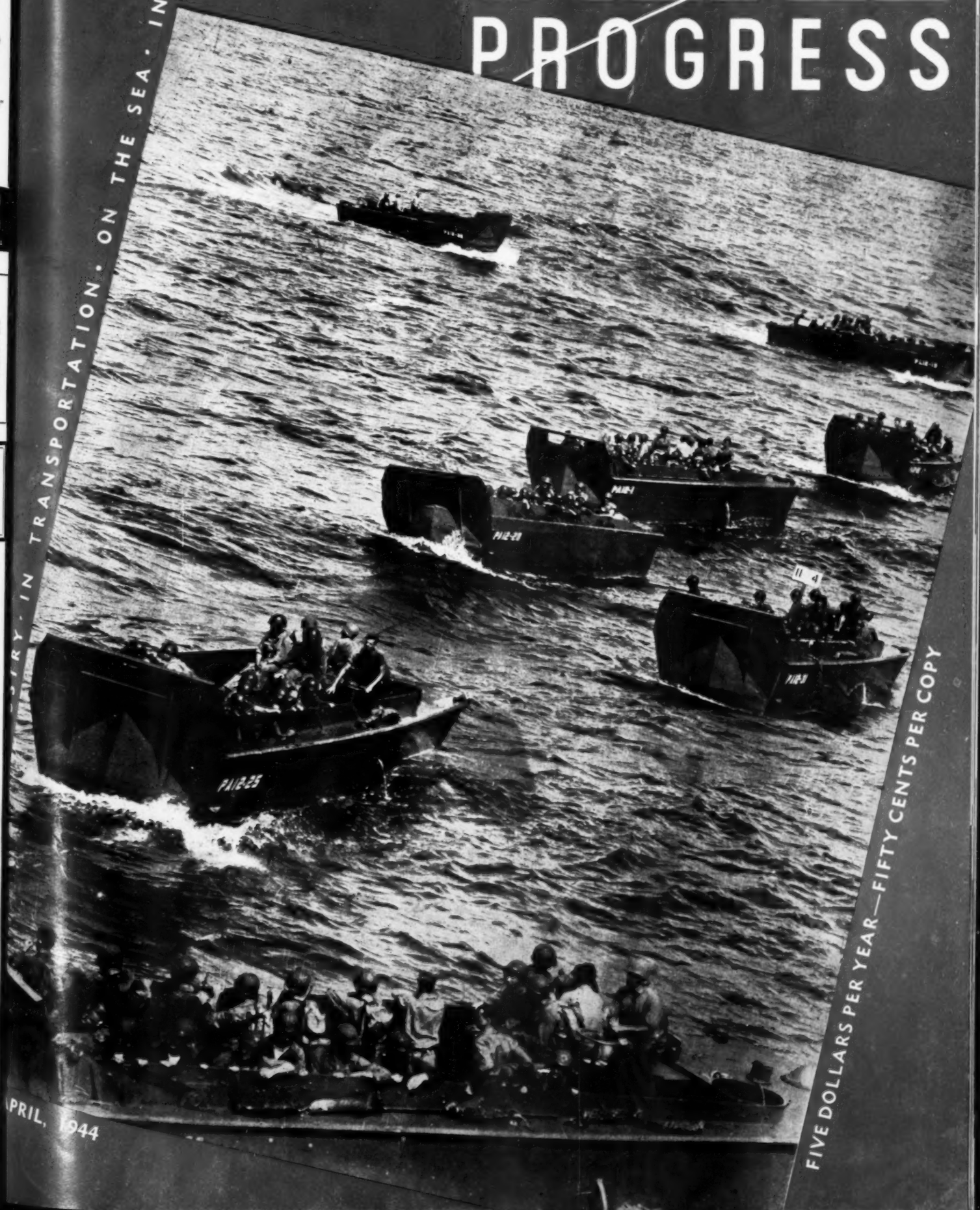


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# DIESEL and GAS ENGINE PROGRESS

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FRONT COVER ILLUSTRATION: A group of "PA" landing boats powered with Gray Marine Diesels; a scene which has been enacted many times. According to a news dispatch—"the small number of casualties—was due to the fine performance of the Diesels which powered the great flotilla." *Press Association Photograph.*

TABLE OF CONTENTS ILLUSTRATION: Caterpillar Diesel tractors smoothing out a curve on the "Grapevine," a six-mile stretch of kinks on U. S. Highway 99 north from Old Fort Tejon, California.

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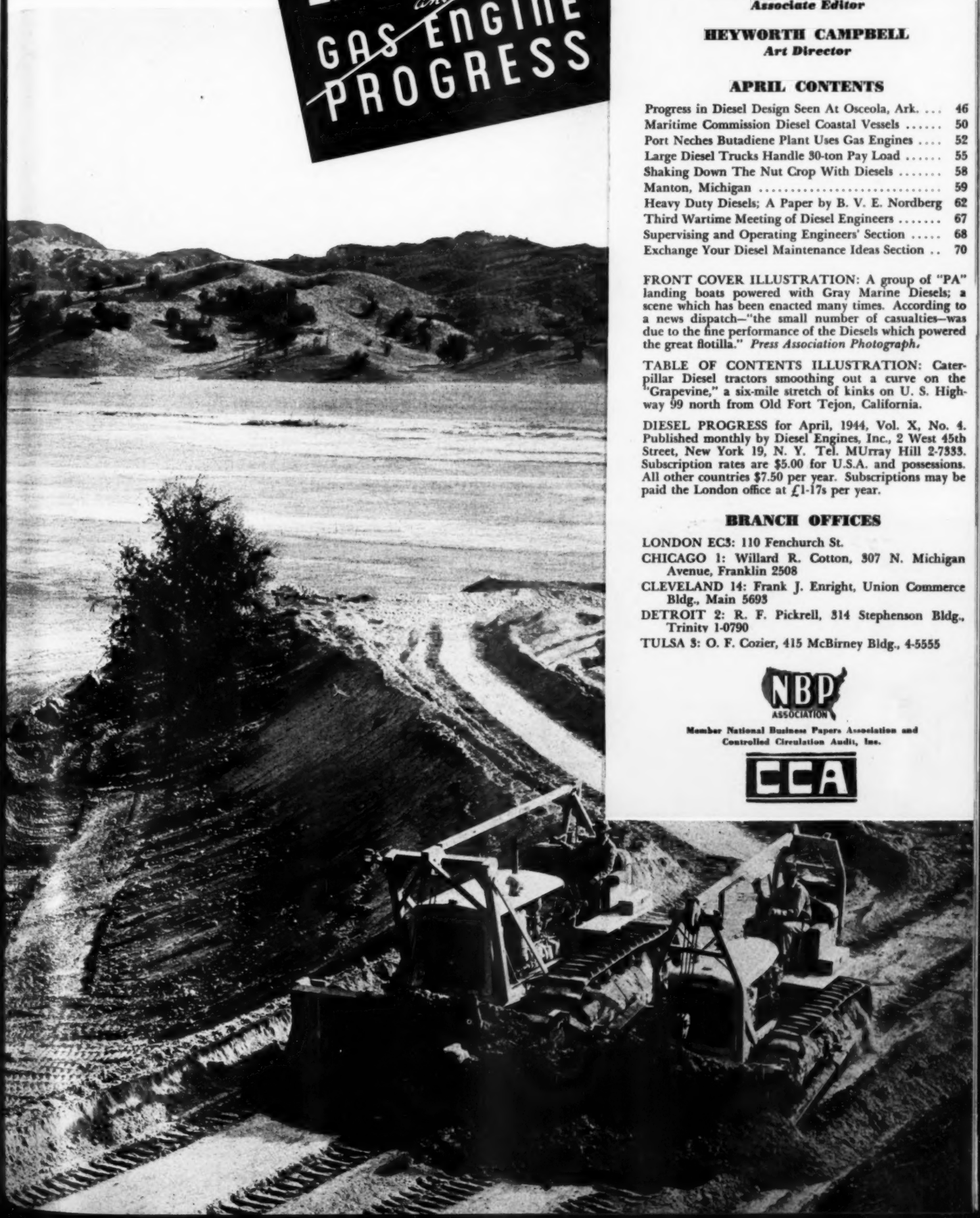


# DIESEL PROGRESS TRACED AT OSCEOLA, ARKANSAS

*By* GLENN C. BOYER*

PROGRESS in the development of American Diesel engines over the past third of a century is well illustrated by the six engines installed in the municipal power plant at Osceola, Arkansas. The first engine antedates World War I, while the last engine was installed only a short time before Pearl Harbor.

The changes, both in performance and design, are well illustrated in this plant, and a description of the several engines together with operating data ably shows these changes and improvements.

The oldest engine, installed in 1912, is a De La Vergne, single cylinder, horizontal unit originally rated at 130 hp. and operating at 164 rpm. This engine with a 20-in. bore and 34½-in. stroke was designed as an air injection unit. It was converted to mechanical injection in 1923 at which time its capacity was increased to 150 hp. This engine operates a 112 kw. alternator through a belt drive. While this engine is not used regularly, it is still maintained in operating condition for emergency service.

This De La Vergne model was built in several cylinder sizes and as one-, two-, or four-cylinder, horizontal units having capacities ranging from 100 to 600 hp. It is a low-compression unit with a maximum pressure of 280 psi.

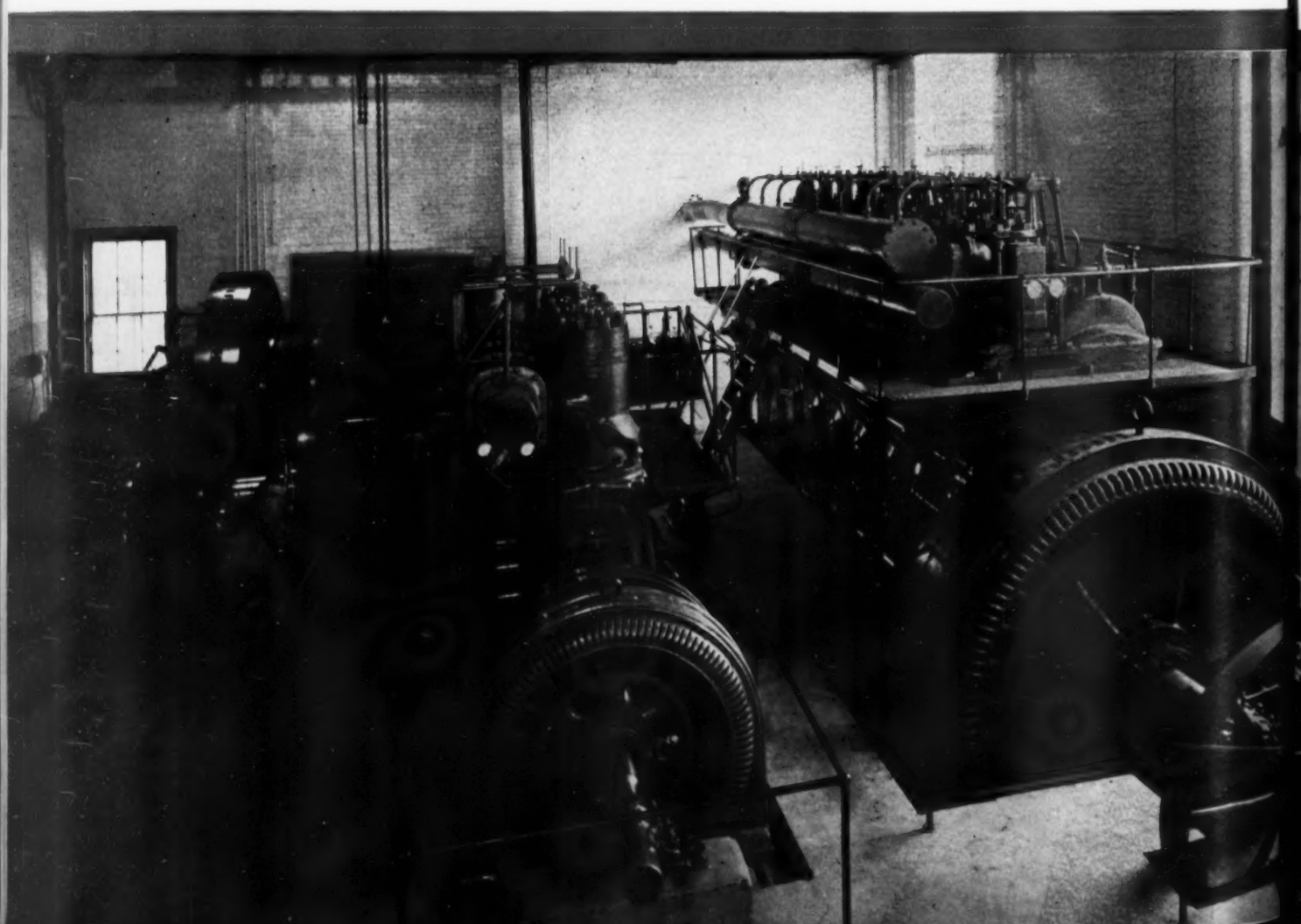
A combustion chamber, located on the side of the cylinder head in the original engine served as a hot bulb to ensure igniton of the fuel charge at the low compression pressure. It was necessary in starting the engine to heat this combustion chamber with a blowtorch for several minutes before the engine was turned over.

The fuel-consumption guarantees under which this engine was sold are rather interesting in the light of present-day practice. As set forth in bulletin issued by the manufacturer,

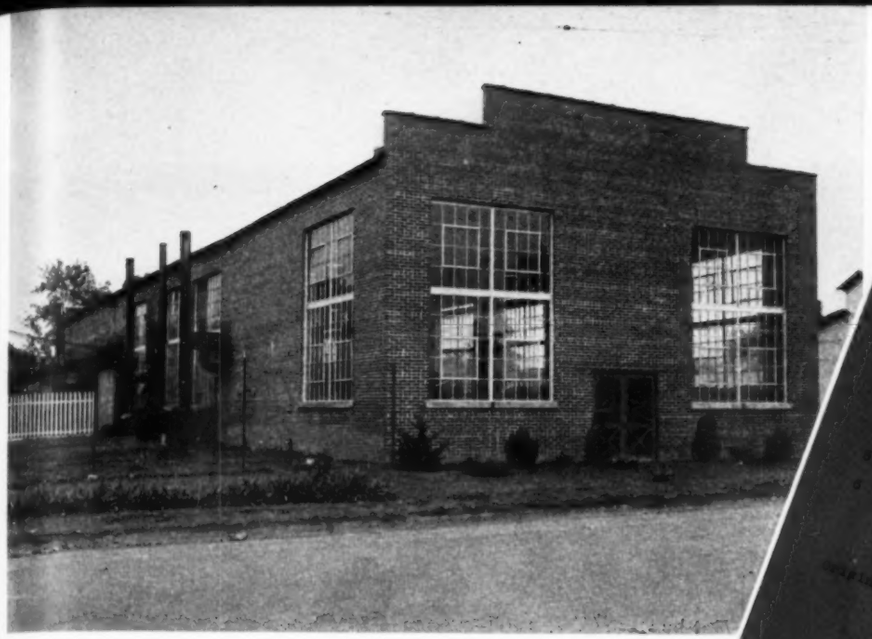
"Our standard guarantee for the type 'FH' engine is that its fuel consumption shall not exceed the following quantities of any crude oil, distillate or fuel oil produced in the United States or Mexico, the power to be measured on the engine shaft and the fuel to have a lower heat value of not less than 18,000 Btu per pound containing not over 1% of water. These guarantees are made irrespective of the gravity of the fuel or its sulphur content.

Full load .....0.5 Lbs. per bhp.-hr.
¾ load .....0.5 Lbs. per bhp.-hr.
½ load .....0.57 Lbs. per bhp.-hr."

This guarantee is interesting today because of its emphasis on the lower heat value of the fuel and the wide latitude of fuels permitted. Since, for all practical purposes, the lower heating



* *Associate Engineer, Burns & McDonnell Engineering Company.*



*Exterior view of the Osceola, Arkansas, municipal Diesel generating plant.*

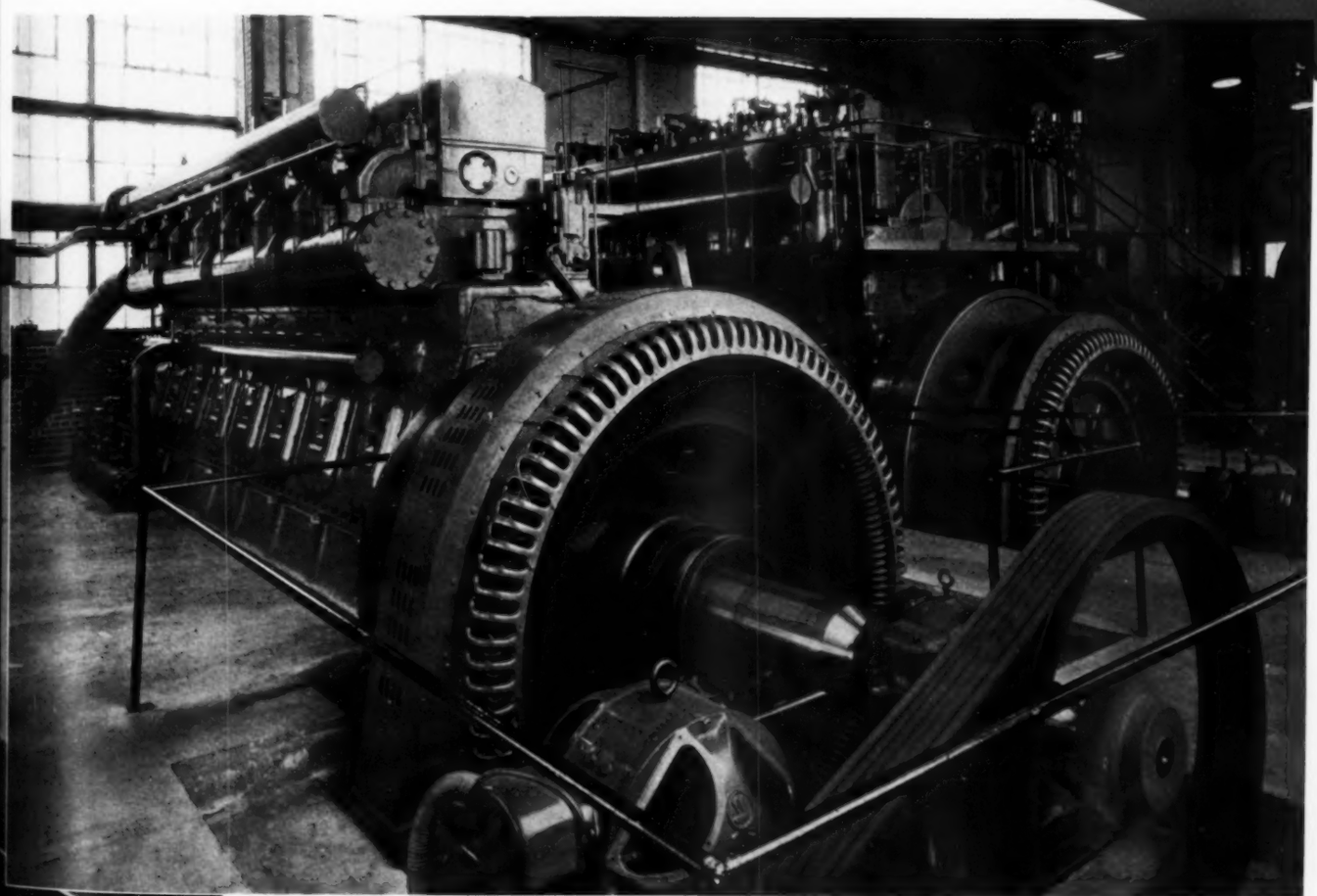
Table 1 – Mechanical Characteristics Osceola Engines

| Engine No | Date | Piston Size | RPM | Hp per Cyl | Piston Speed fpm | Brake mep psi |
|---|---|---|---|---|---|---|
| 1 | 1912 | 20 x 34 1/2 | 164 | 150 | 944 | |
| 2 | 1922 | 16 1/2 x 13 1/4 | 327 | 66.7 | 720 | 60.0 as |
| 3 | 1927 | 17 x 26 | 200 | 100 | 838 | 49.6 a |
| 4 | 1935 | 17 x 26 | 225 | 125 | 837 | 69.9 |
| 5 | 1939 | 17 x 26 | 257 | 125 | 837 | 77.7 |
| 6 | 1941 | 16 x 20 | 327 | 125 | 1090 | 77.7 |

a Two-stroke cycle engine

Original bmep was 59.8 psi, 60.1

as after conversion to mechanical injection of fuel.



*Above: Left to right, units No. 6, 4 and 3, respectively. These are all Worthington Diesels, the mechanical characteristics of which are given in the table above.*

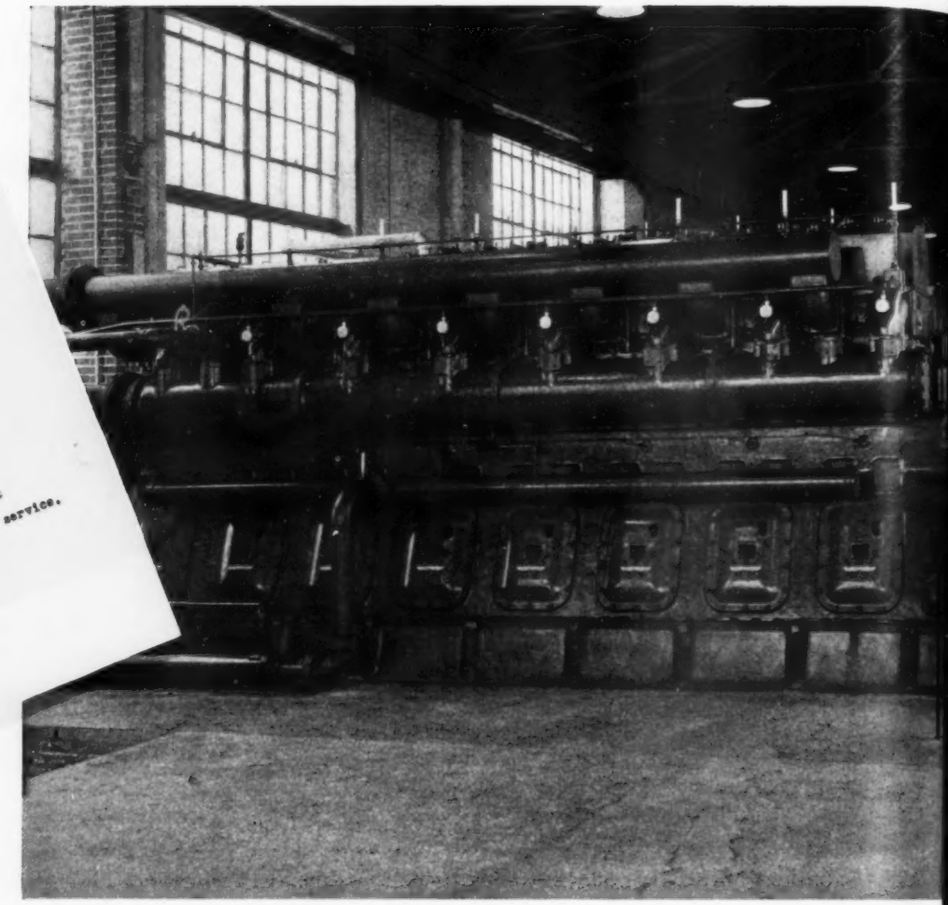
*Left: Left to right, units No. 1, 2 and 5, respectively. No. 1 is a De La Vergne single cylinder Diesel, the other two are Worthingtons: see table above.*

Table 2 - Fuel and Lubricating Oil Economy

| Engine | Date Installed | Hours Oper. | Bhp per Gal fuel | Rated hp-hr per Gal lube oil |
|---|---|---|---|---|
| | | | | Gls.a |
| 2 | 1922 | 1300a | 8.08 | 2,888 |
| 3 | 1927 | 2031 | 10.09 | 4,882 |
| 4 | 1935 | 2645 | 12.02 | 7,702 |
| 5 | 1939 | 5715 | 11.95 | 6,117 |
| 6 | 1941 | 997 | 12.96 | |

a Estimated

Note:- No performance data given for Unit No. 1 since it is held for standby only and not maintained in regular service.



*Above: Unit No. 6, a 1000 hp. Worthington Diesel and 700 kw. alternator, installed in September, 1941.*

*Right: The first unit installed at Osceola, 130 hp. De La Vergne, single cylinder, horizontal Diesel.*

value of petroleum oils will average 5 per cent less than the gross or high heat value, the guarantees as given based on 18,000 Btu lower heat value are comparable to those based on 19,000 Btu high heat value, the standard established by the former Diesel Engine Manufacturers' Association. Incidentally, this fuel consumption guarantee is from 25 to 35 per cent over present-day guarantees, indicative of the improvement in fuel economy realized through the intervening years.

Engine cooling was apparently of no great concern since the cooling water requirements for this engine were given as approximately 3 gal. per bhp.-hr. with a maximum outlet temperature of 180 degrees F. Under these conditions the temperature rise of the cooling water was probably in excess of 100 degrees F., an extremely great temperature rise in light of present operating experience.

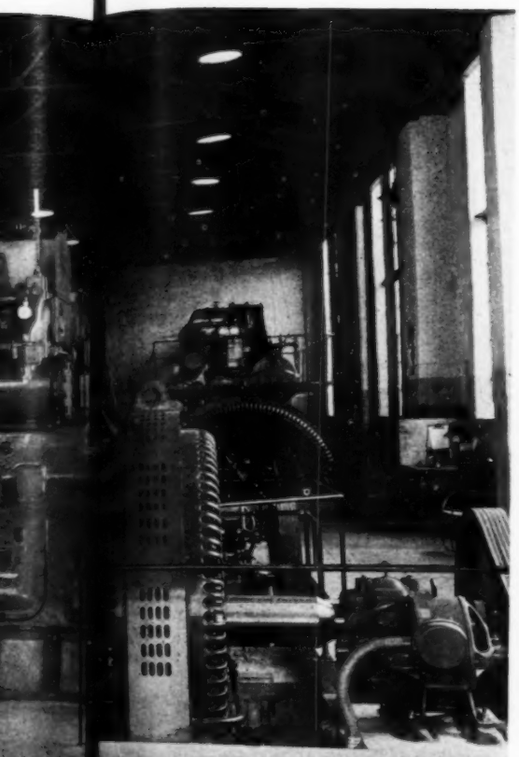
The second engine, a 200 hp. Worthington two-stroke cycle, crankcase scavenging unit direct connected to a 135 kw. alternator was placed in operation in 1922. This is a three-cylinder, 12½ x 13¼-in., 327 rpm., vertical unit employing mechanical fuel injection. It is operated regularly in conjunction with other units in the plant. This two-cycle design, introduced by Worthington in 1919, was discontinued in 1928

In 1927 the third unit was installed. This is a 300 hp. Worthington, four-stroke cycle, three cylinder unit driving a 200 kw. alternator. The cylinder size is 17 x 25-in. and air injection of fuel is used. The engine speed is 200 rpm.

This was followed in 1935 by a five-cylinder, four-stroke cycle Worthington engine of 625 hp. capacity direct connected to a 430 kw. alternator. The cylinder size is 17 x 25-in. and the rotative speed is 225 rpm. Mechanical fuel injection is used. The unit is equipped with a Woodward governor.

The fifth unit, installed in 1939, is another Worthington 17 x 25-in., eight cylinder, 1000 hp. engine operating on the four-stroke cycle. This engine employs mechanical fuel injection. It drives a 700 kw. alternator and operates at 225 rpm. A Woodward governor is used.

In September, 1941, the sixth and last unit was placed in operation. This Worthington engine of 1,000 hp. capacity drives a 700 kw. alternator. It is a four-stroke cycle, 327 rpm., eight cylinder engine with 16 x 20-in. cylinders and employing mechanical fuel injection. Speed control is effected by a Pickering governor.



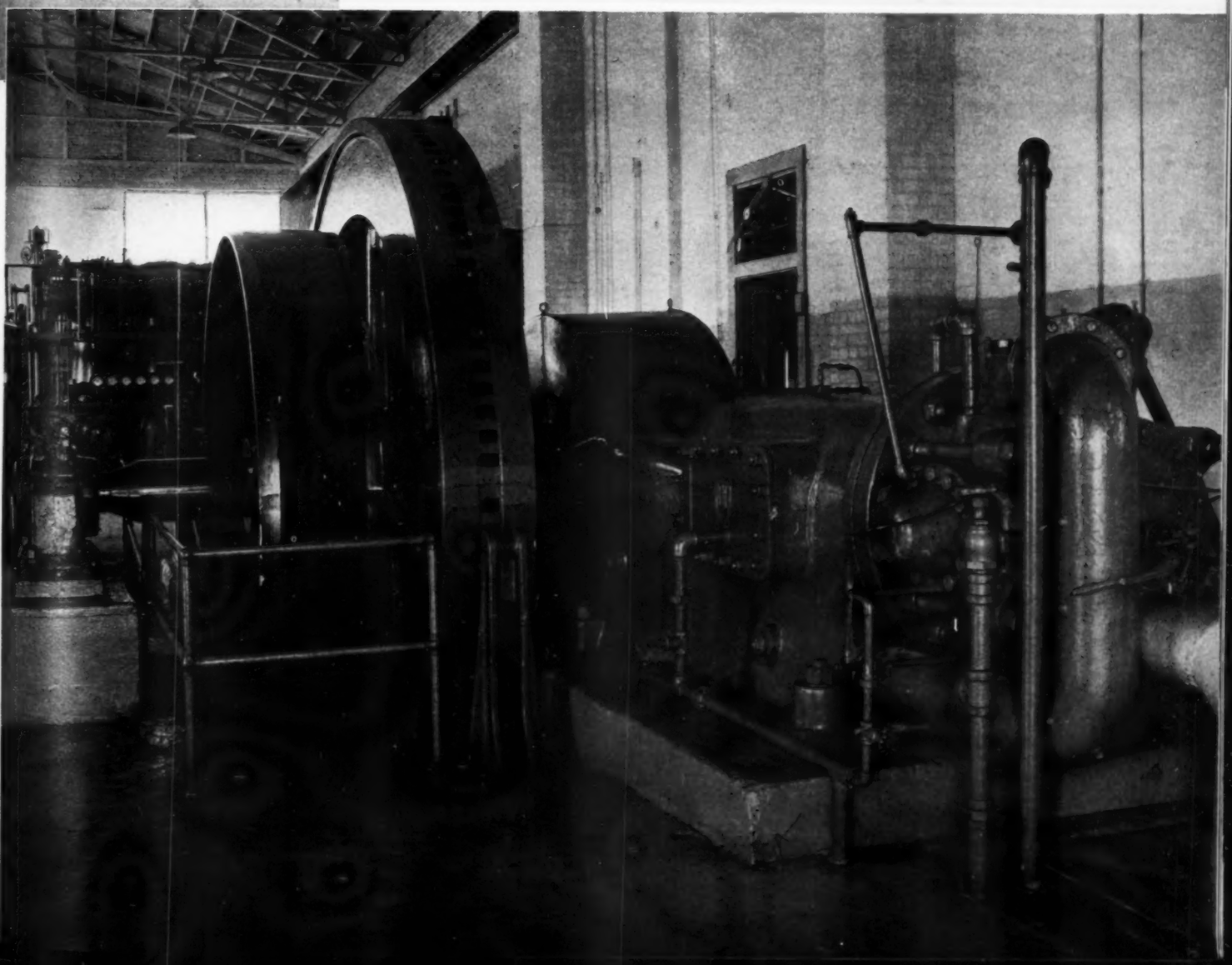
It is interesting to compare the piston size, rotative speed, piston speed, and brake mean effective pressure of the engine in this station. They are summarized in Table 1.

So much for the basic mechanical features of the several prime movers. Fuel economy and lubricating oil consumption have been improved through design progress and refinements as shown by the performance of the engines in this plant. Some of the improvement may be the result of better mechanical condition of the newer engines, although all of the difference cannot be attributed to this cause.

At the time the data for Table 2 was assembled, a record of only the first four months operation of Unit No. 6 was available, although the unit had been in service over a year. This better economy of the newest unit was amply demonstrated during its first year of operation with an overall plant production of 12.4 kwh. (gross) per gallon of fuel oil compared with 12.0 kwh. the year previous.

The general layout of the plant has been developed with a view to simplicity. Since this plant has been in operation over 30 years, it is only natural that the arrangement of equipment and accessories has been influenced to a marked extent by the year-by-year needs for additional generating capacity. In spite of this limitation, however, additions have been made in a manner which facilitates operation, and today the plant is doing its job in a very creditable manner as evidenced by its record.

Such records as that of this Osceola, Arkansas plant—and it is typical of hundreds of similar plants—are tributes to the advances in design and workmanship made by the Diesel industry in its comparatively short history. One of the outstanding advantages of Diesel prime movers —as exemplified in the Osceola plant record is the long life of the engines, which permits of long-term amortization.

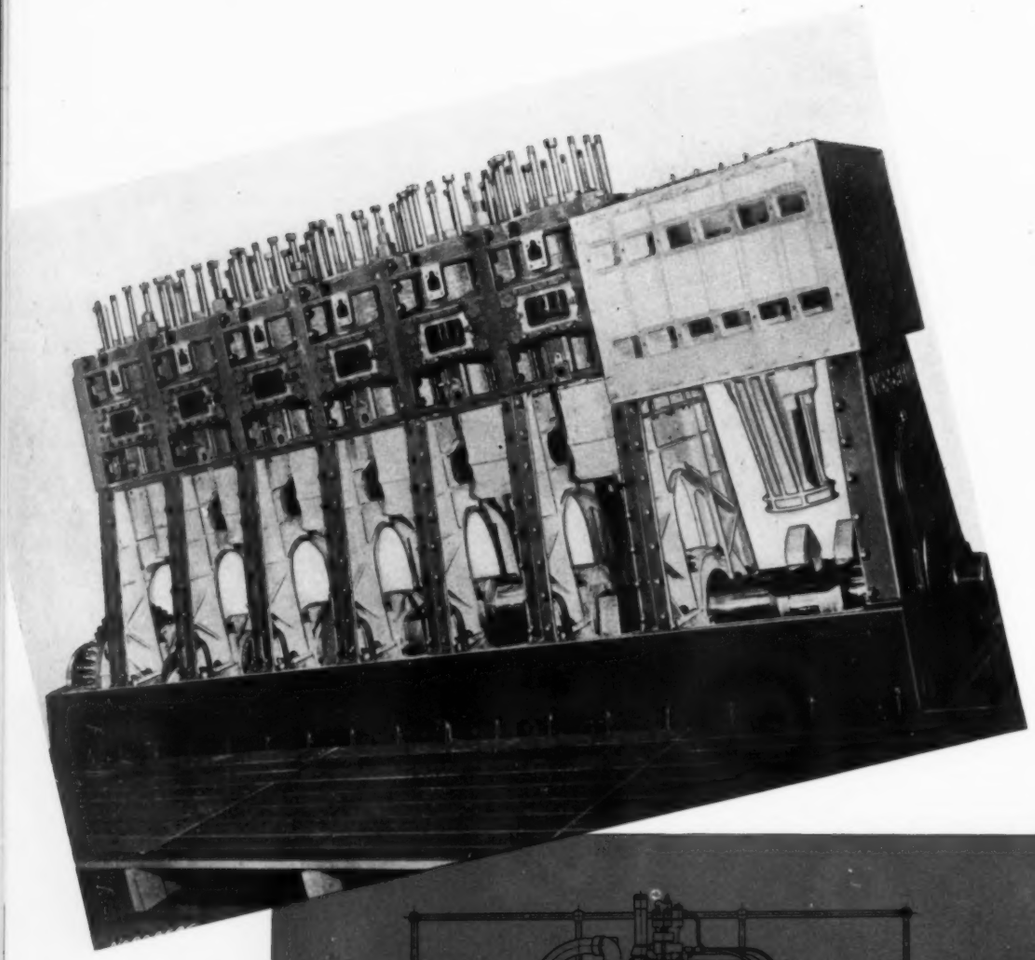


THE Maritime Commission's design classification, C1-M-AV1, designates a new Coastal type cargo vessel, some hundred of which are now either building or scheduled in Great Lakes Yards. The first of this type will be completed in the early Fall of this year. Embodying many interesting features yet to be announced, these Coasters will measure 320 ft. length, 50 ft. breadth, 29 ft. depth, with 18 ft. draft and, approximately, 3500 gross tonnage.

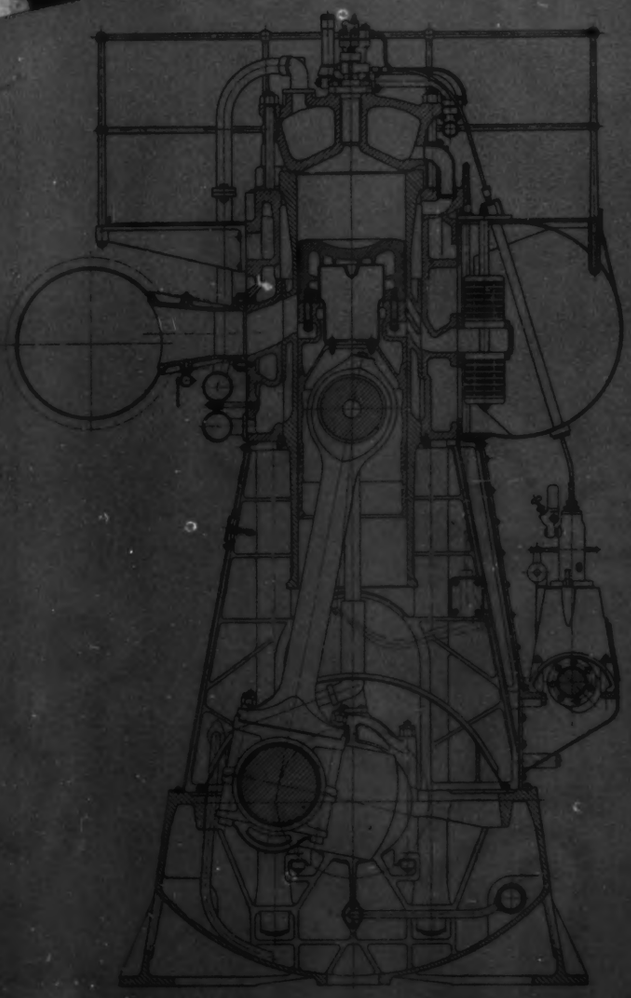
Seventy-five of the first lot of new C1-M-AV1 ships will be powered with Nordberg Diesels, a single propulsion engine in each ship, direct connected to the propeller shaft. The engine is accordingly direct reversing and is two stroke cycle with six cylinders of 21½ in. bore and 29 in. stroke. Although normal shaft horsepower is 1700 at 180 rpm., the engine is capable of delivering 10% continuous overload which is 1870 hp. at 186 rpm. It will also deliver 25% overload for periods of two hours duration which amounts to 2125 hp. at 194 rpm.

This Nordberg Diesel is of trunk piston design with American-Bosch mechanical injection. The complete wet weight of the engine, including the attached scavenging pump and main thrust bearing, with cooling and lube oil systems filled as well as American Bureau of Shipping spare parts, gauges, pyrometers, tachometers, revolution counters and a complete set of tools is approximately, 265,000 pounds.

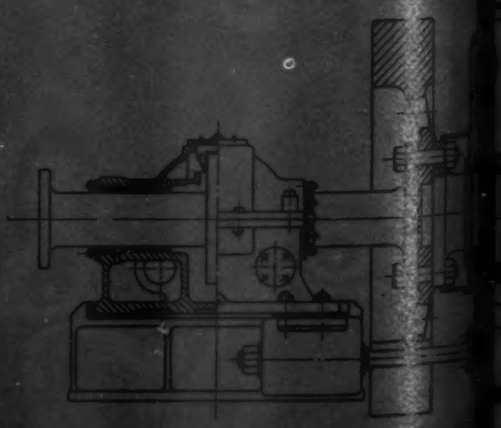
In general, the Nordberg Diesels going into these coastal vessels are the same as the engines supplied for the Maritime Commission C1 cargo vessels except that, in the present case, the engine control is mounted directly on the engine, whereas in the C1 cargo ships, where two engines were installed, a central control station was installed between the engines. Much more of interest on these vessels and their machinery will be publishable later in the year.

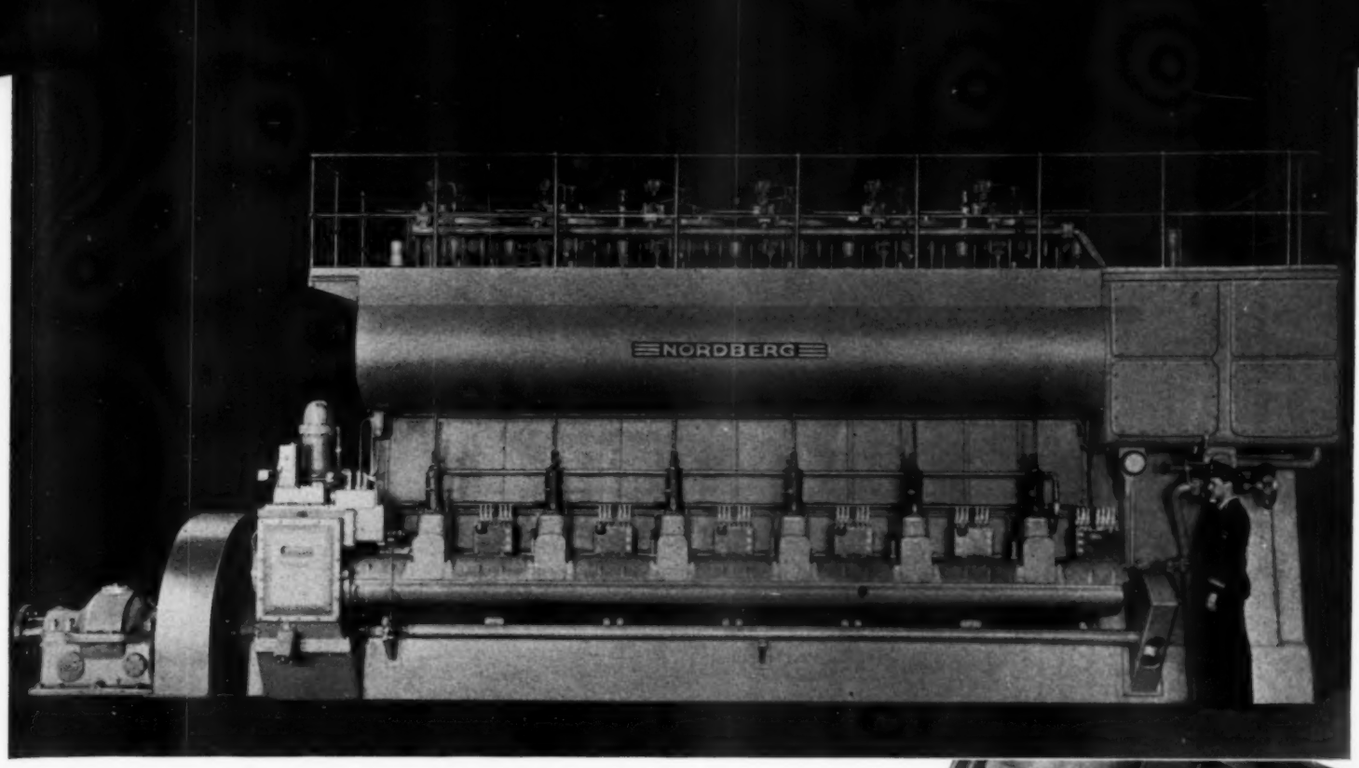


*Shop view of the partially assembled Coaster Diesel.*



*Cross section through a power cylinder construction of cylinder head, piston and crankcase.*

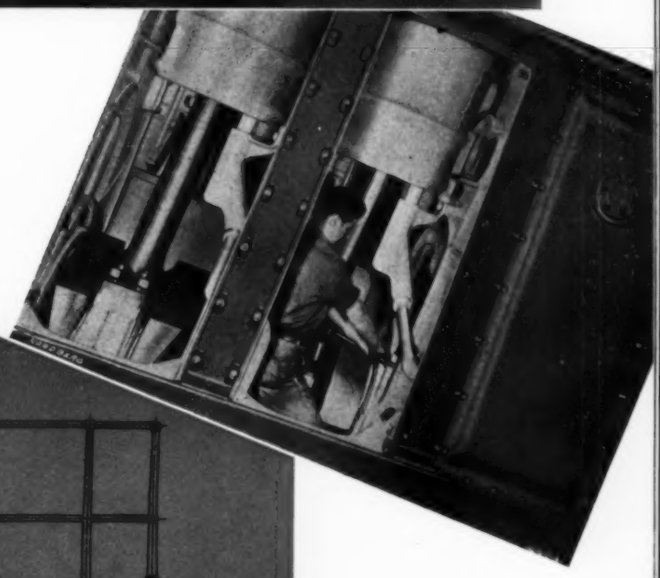




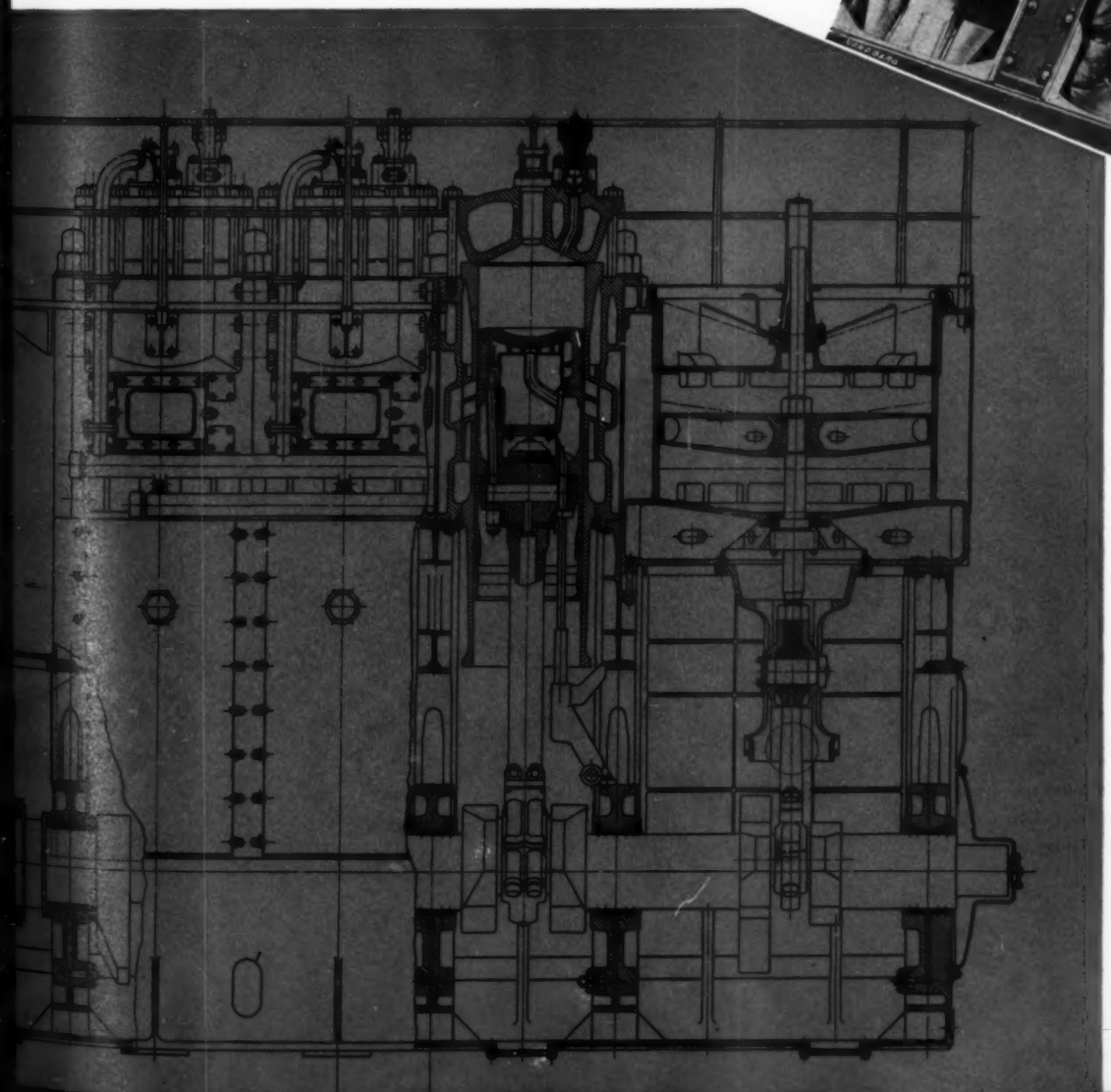

*View of the completed engine; scavenging pump, extreme right.*

# C1-M-AV1 DIESELS

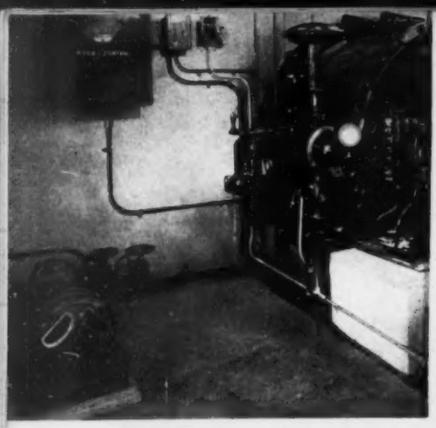
*By* WILL H. FULLERTON



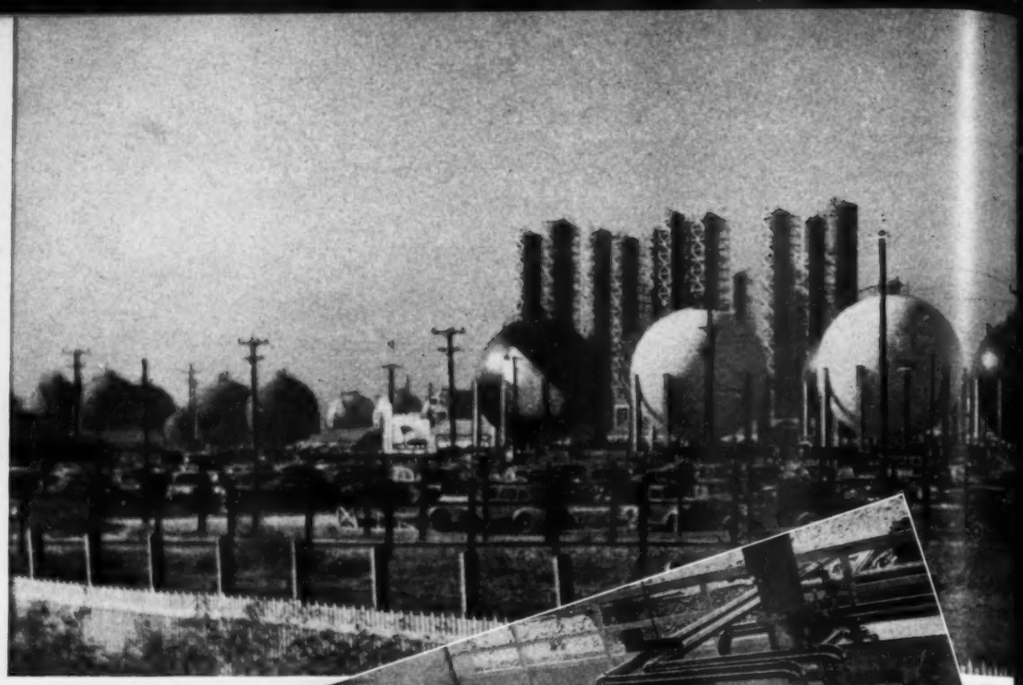
*This view of two crank throws and connecting rods compares the size of these parts with a good sized man.*



*Longitudinal section showing details of one power cylinder and scavenging pump.*

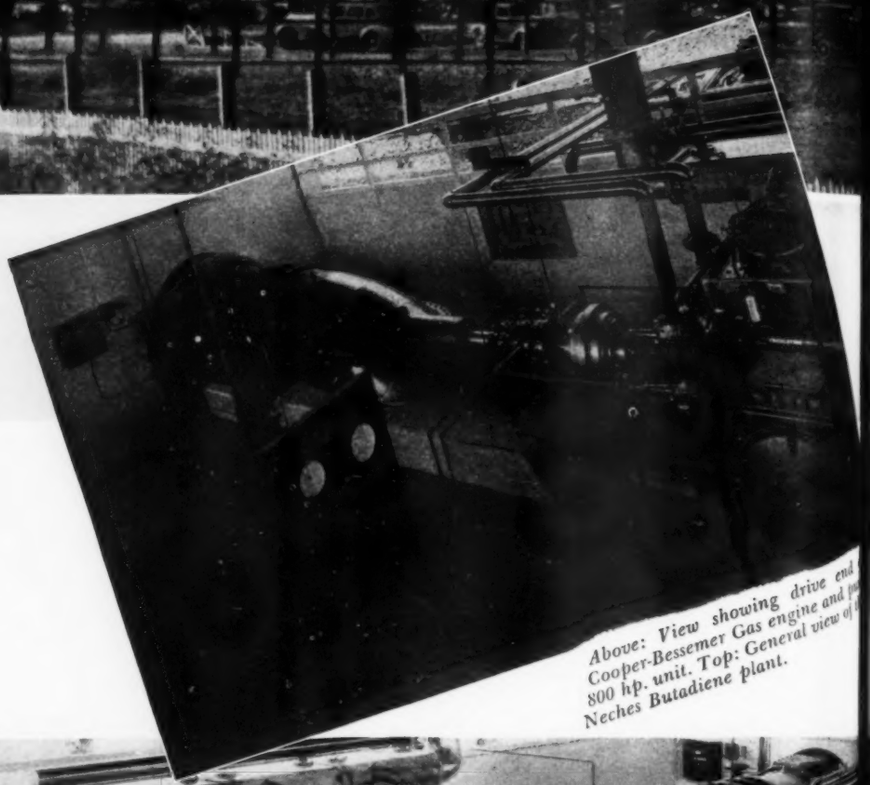


*This device automatically controls the blade angle of the pumps.*



# PORT NECHES BUTADIENE PLANT

*By* GEORGE D. CROSSLEY

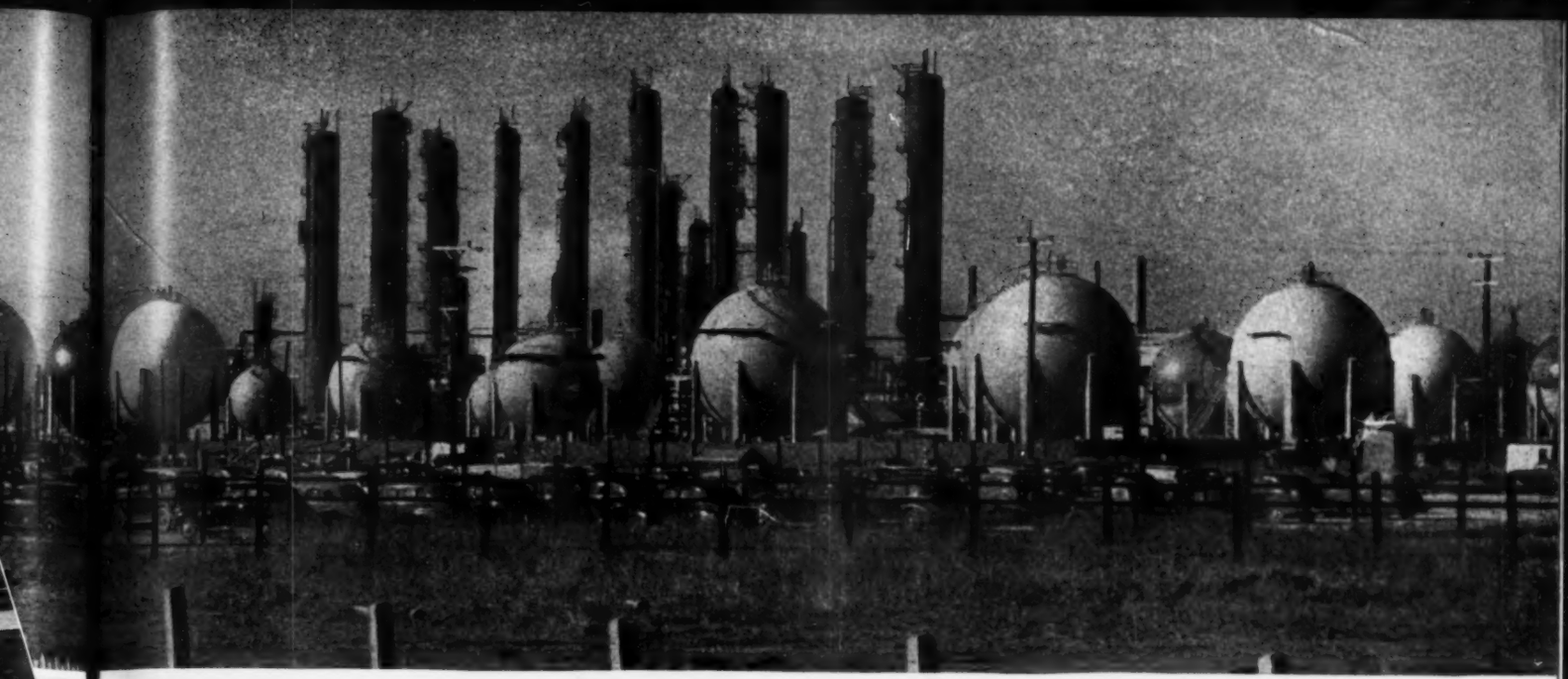


*Above: View showing drive end Cooper-Bessemer Gas engine and 800 hp. unit. Top: General view of Neches Butadiene plant.*

THE process of manufacturing butadiene is complicated and difficult for the average person to understand. But essentially it is something like this: In the process of refining crude oil each of the five participating refineries obtains a gaseous substance known as butane-butylene, which serves as the raw stock for the making of butadiene. This raw stock is piped from the refineries direct to the butadiene plant at Port Neches, and to assure a constant supply it is stored in the huge spherical-shaped pressure tanks.

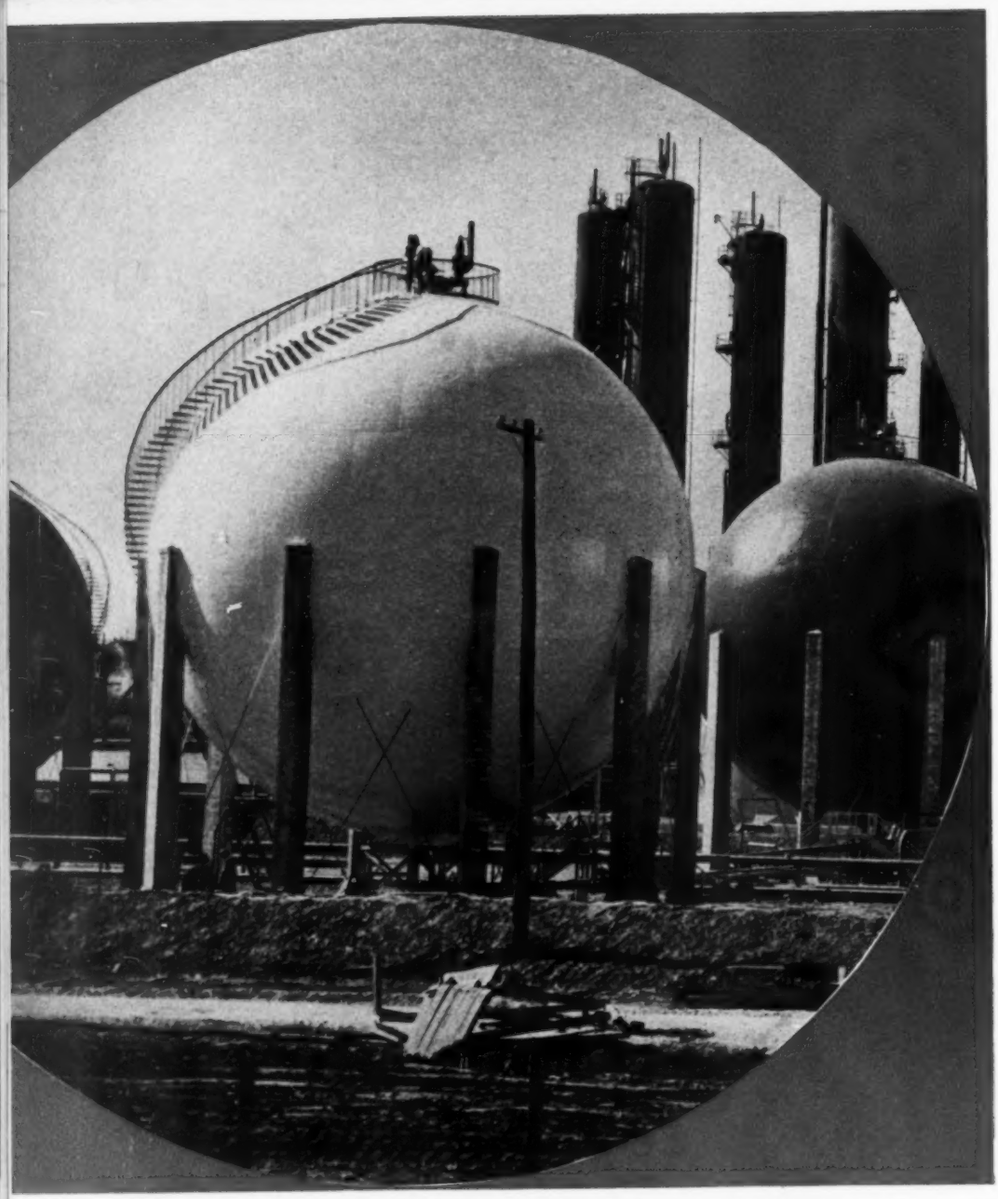
The raw stock actually is a mixture of normal butane and isobutane, and normal butylene and isobutylene, although the gas is commonly called butane-butylene. The normal butylene must be isolated in a highly pure state. This is very difficult to do since these materials all boil at nearly the same temperature. Vigorous fractionation is necessary, and then the product must be treated with acid and solvents before the pure normal butylene is obtained. The second step is carried out in a dehydrogenation plant, and this is the most difficult and unusual operation in the entire process.

The work to be done in this revolutionary operation is to slice off some of the hydrogen units of the pure butylene. If these can be sliced off just right, butylene can be converted into butadiene. The process probably is best described by an oil expert who said: "Imagine a big hall



*Above and left: Views of the two Cooper-Bessemer V-type, eight cylinder, 800 hp. Gas engine pumping units, totaling 250,000 gpm. capacity. Right: View of the battery of Clark angle compressors; there are six units in all, of 2000 hp. each.*

(one of the giant steel towers at Port Neches) with ten million fleas in it. They send you in with a sledge hammer and a crowbar and tell you to knock off the right hind leg and left



*Raw stock from refineries is stored in these huge spherical vessels under pressure.*

front whisker of each flea and then, when you've finished, to sort out all the fleas that you've maimed in the process."

The work of dehydrogenation is so difficult that only 20 per cent of the butylene is converted to butadiene while passing through this network of dehydrogenation equipment. The remaining 80 per cent is re-run and slowly but surely converted.

Superheated steam is needed in this new dehydrogenation process. Steam never had been used at this temperature by this method in industry before, and so a plant had to be developed for this purpose. It is done by using a battery of superheaters in which steam from the central steam plant is reheated. This intensely hot steam is mixed with the butylene before it is routed through twelve dehydrogenation reactors. As the steam is then mixed with the butylene gas, it must be removed before the manufacturing process can be continued.

After the steam removal operation, the gas, now containing some butadiene, is cooled and compressed. Six 2000 horsepower Clark angle compressors, enough to power 120 automobiles, are used. At this stage the product contains about 20 per cent butadiene and 80 per cent butylene. These two are separated in a series of complex treatments in another battery of giant steel towers which comprise the third, or purification step. The freed butylene goes back for re-cycle trips through the dehydrogenation plant. The final butadiene will be above 98.5 per cent pure, which unusually high degree of purity is required for the production of synthetic rubber.

In this process plant a reliable water supply is of critical importance. In order to meet this number-one requisite, it was decided to utilize Gas engines for pumping the tremendous supply of water required. The requirement is 250,000 gpm. which required two 800 hp. Cooper-Bessemer Gas engines. These units are directly connected to variable pitch impeller type water pumps and run at a top speed of 325 rpm. Several unique requirements had to be met in order to make this installation function satisfactorily. The most difficult problem to solve was to maintain a satisfactory water level in a pump suction pit located approximately 6,000 ft. from the main pump discharge pit, the two pits being connected together by concrete ducts. In order to do this, it is necessary to maintain a satisfactory level in the main pump discharge pit at all times and under variable demands. To accomplish this it was necessary to automatically control the levels in the main pump discharge pit as well as that of the main pump suction pit. It was decided to control this demand by speed controlling the engines from 225 rpm. to 325 rpm. and automatically control the blade angle of the pump.

It was necessary to control the main pump discharge pit level through the use of an air bubble system for maintaining hydrostatic pressure on a manometer type controller directly controlling both engine and pump. Due, however, to the long time lag between this pit and the main pump suction pit a telemeter type of control was installed obtaining its indication through the use of a bubble type system from the main suction pit to automatically raise the level in the main discharge pit on sudden increase of demand and lower the level on sudden decrease in demand. This is done by the telemeter type of control resetting the control point in the main pump discharge pit controller.

Another unusual requirement is that these engines must operate at all times under highly variable demands, much of the time at extremely light loads. This is possible through several unique features inherent in the engine design such as type of gas injection and scavenging used on these engines. This application is unique in that criticals throughout variable speed range must be virtually non-existent for satisfactory operation of this type pump. These engines meet this essential because they are designed normally for wide ranges of speed in other applications. Continuity of operation is another feature of the G-MV engines since they were developed to meet many phases of continuous process work.

*A Kenworth tractor powered with a Cummins, 100 hp. supercharged Diesel, hauling a pair of specially built Fruehauf trailers loaded with treated bulk magnesite.*

# DIESELS WALK OFF WITH 30-TON PAY LOAD

*By* JIM MEDFORD

WHAT was once only a photographer's means of getting a picture is now one of our most strategic metals. The lightest and toughest yet discovered, much of it has and is being made from common ocean water—5,700,000 tons to a cubic mile.

Over in the Nevada Desert a mountain is being poured into electric furnaces with temperatures around the thousand degree mark. They discharge their brew into receptacles that resemble nothing else but a throwback to the birthplaces of our national drink of World War I.

Harmless looking though it is, it will burn through metal or make an airplane. It has three times the tenacity of mild steel—*It's Magnesium!*

Because basic magnesium—B.M.I. to the industrial world—has built a plant so huge it is a military secret, this irrelevancy will hint as to its size: Enough paint was used on the plant to make a three inch strip three times around the earth—250,000 gallons.

Built at a cost of 25 million dollars and having a weekly pay-roll of $1,000,000, its formula is: take some salt, some coal, some peat moss, some magnesium oxide and some chlorine. Mix and make into pellets. Treat these in a chlorinator; you get some magnesium chlorides. Give this brew a shot of high amperage "juice." Presto! —You have metallic magnesium.

Operating on a gigantic schedule, its peak output will be 600,000,000 pounds of the much needed metallic magnesium. Blended with various alloys, it is used in a multitude of manufacturing processes. In the aircraft industry, for instance, castings in the control systems, main undercarriage mountings, tail wheel forks, radius rod coupling, and many other important parts are of this light, tenacious metal. Blended with other materials it is also used for tracer bullets, flares and incendiaries. But before a pound of the metal or a pound of cement could be manufactured or put in place 2,300 drawings had to be made. These had a total square footage of just about 30 acres.

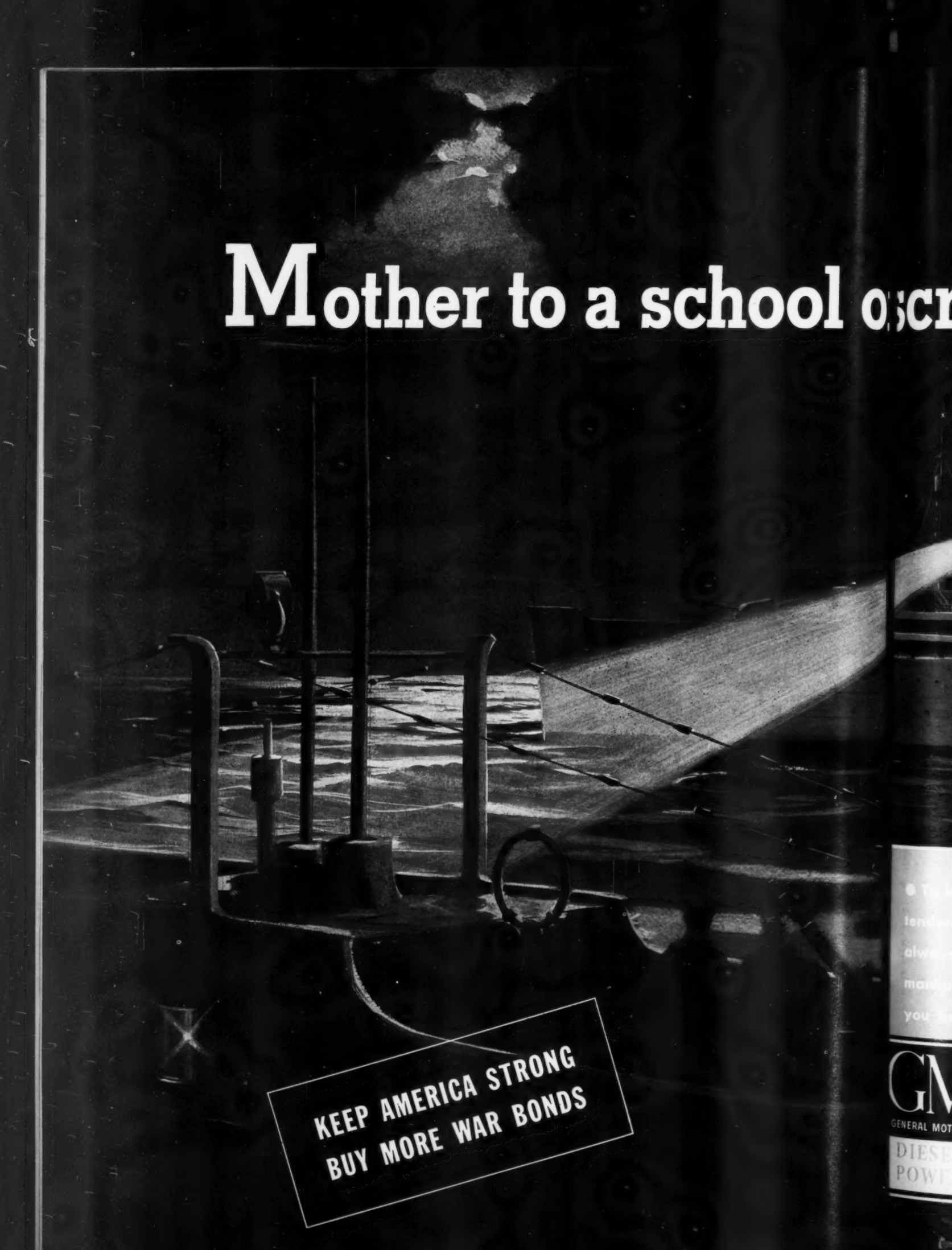
But to get the raw magnesite from the mine at Gabbs, Nevada, it is a dump truck proposition, Diesel, too. However, from the oxidizing plant at Gabbs to the railhead at Lunning, Nevada, it's a Diesel tractor-train job of special design weighing 101,000 pounds gross and carrying a payload of thirty tons in the two enclosed six-wheel-dual trailers.

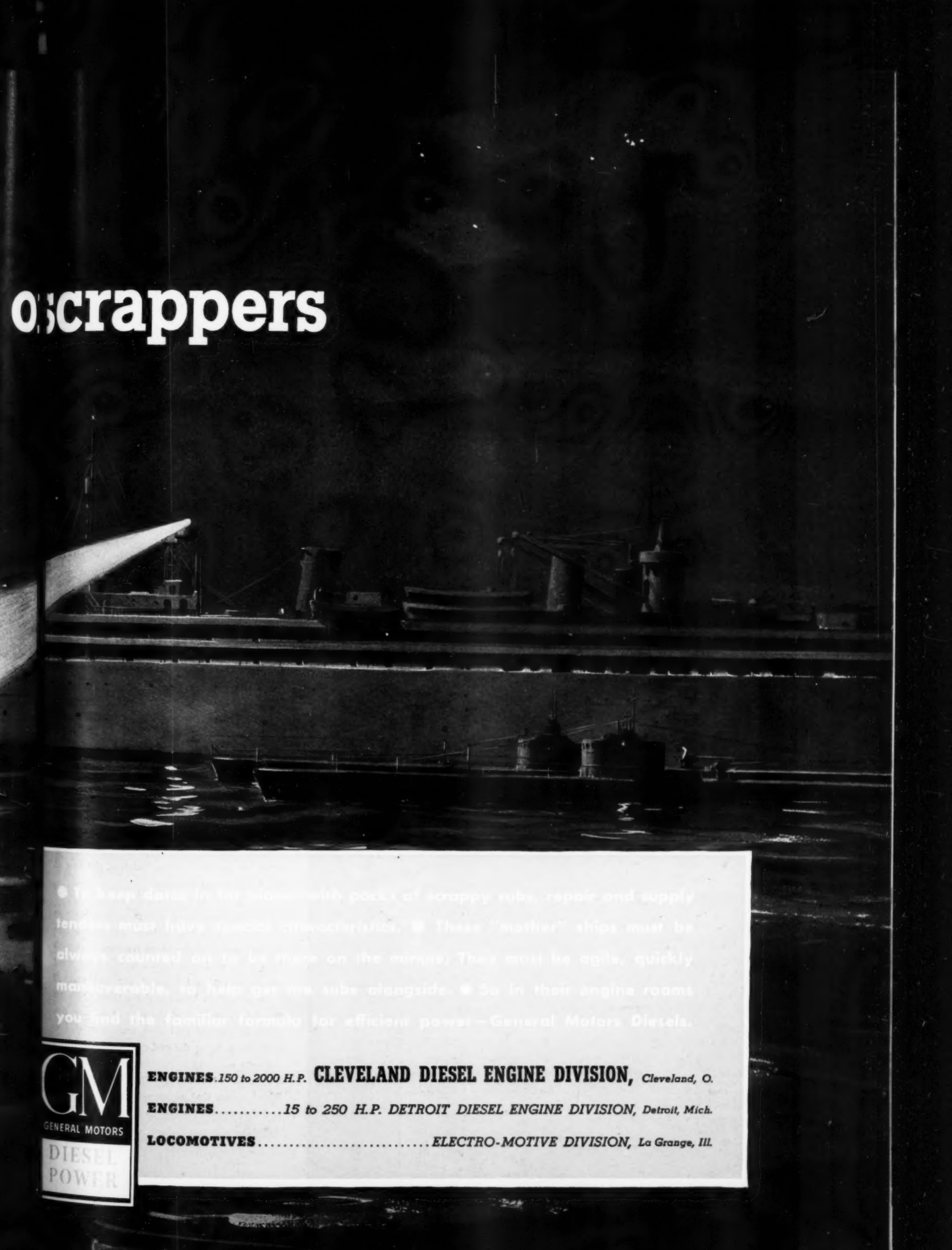
Limited to the 32-mile run from Gabbs to Lunning because of the Alphabetical Bureaus' too many "NO's"—no tractors, no trailers, no tires to make the complete haul from Gabbs to Las Vegas, Nevada, and the main plant, it means a round-about detour of 1,120 miles via Ogden, Utah, taking days instead of hours via the 332-mile over-the-highway route.

But with much satisfaction until the Lunning railhead is reached, the haul is a Diesel one—supercharged Cummins in the Kenworth dumps, mine to plant in the Gabbs Valley, and more Cummins in the fleet of six Kenworth tractors to railhead.

Received from the oxidization plant, the magnesite is a flour-fine powder. Because of its susceptability to moisture, it must be handled carefully in moisture-proof containers. At the railroad, discharge is through trailer-bottom screw-fed outlets direct to car loading conveyors.

Each tractor is equipped with American Chain and Cable's Tru-Stop propeller shaft emergency brake. Bendix-Westinghouse air brakes are standard on all units. Starting batteries are heavy duty Exides and trailers were specially built for this job by Fruehauf.


Mother to a school
KEEP AMERICA STRONG
BUY MORE WAR BONDS




● To keep dates in far places with packs of scrappy subs, repair and supply tenders must have special characteristics. ● These "mother" ships must be always courtesy on to be ready on the moment. They must be agile, quickly maneuverable, to help get the subs alongside. ● So in their engine rooms you find the familiar formula for efficient power—General Motors Diesels.

GM
GENERAL MOTORS
DIESEL POWER

**ENGINES** *150 to 2000 H.P.* **CLEVELAND DIESEL ENGINE DIVISION,** *Cleveland, O.*

**ENGINES**.....*15 to 250 H.P. DETROIT DIESEL ENGINE DIVISION, Detroit, Mich.*

**LOCOMOTIVES**.....*ELECTRO-MOTIVE DIVISION, La Grange, Ill.*

# CALIFORNIA DIESELS GO NUTS!

*By* F. HAL HIGGINS

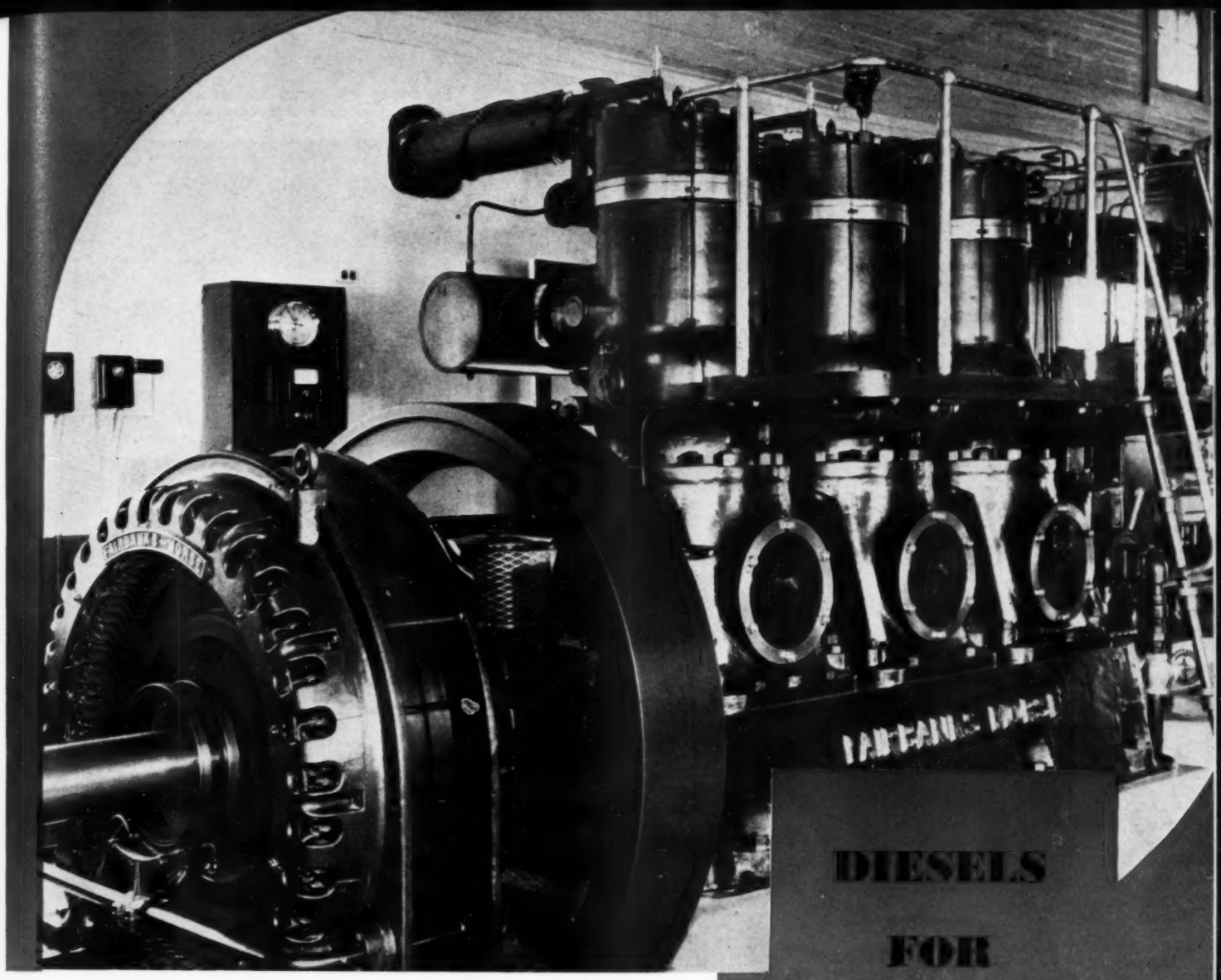
*Above: With this cable connection to the walnut tree some 85% to 90% of the nuts are shaken off by the Diesel tractor fitted with power take-off and pitman arm, shown right. Below: Backing the tractor up to make the cable taut before shaking. This method has been successfully used in harvesting walnuts, prunes, olives and almonds.*

"NUTS to you" means more this year than just a time-worn wisecrack out on the California farming front where men are scarce and women weld ships and planes. Tractors have been harnessed to cut harvest costs and time and get the nut and prune crops into market channels when there are not enough men, women and children available to do the job the old way. University of California extension engineers noted the practical success of several farmers up and down the state in 1942 harvests, so they took the best of some 70-odd jobs seen and standardized them into a few attachments for tractors to permit any farmer with a tractor to go to his local blacksmith or implement dealer and get a cheap job done that would make his tractor a prune or nut harvester.

Your Old Reporter went out to watch Jim Fairbank of the University of California Agricultural Engineering staff put on one of 30-odd demonstrations of the use of tractors in this work. Then, on a trip to Portland, Oregon, last September, he stopped in the upper Sacramento Valley and talked to the leading shop man who had equipped neighboring tractors for prune and almond harvesting. This local shop had changed over some dozen or more tractors, starting the work in the fall of 1941 with old gasoline wheel tractors. The tractors were easily operated, the trees were not hurt, as proved by shaking the previous harvest, and it cut costs and got the job done when others had to leave a lot of crop for lack of time and labor.

Tom Fahey, Caterpillar manager at San Leandro, recently called the writer's attention to two Caterpillars rigged up by Caterpillar dealers at San Jose and Hayward for their walnut farmers. These pictures show how Peterson Tractor & Equipment Co., Hayward, Calif., changed over, or rigged up, a Caterpillar Diesel to do a great job for the Bishop Ranch at the foot of Mt. Diablo, near Danville.

"The previous method of harvesting walnuts on this ranch," says Tom Fahey, "was with 30-foot shaking towers mounted on tractors. Men with long poles and cant hooks on the ends stood on the tower and reached out and grabbed limbs with these hooks to shake them. This got about 60% to 70% of the nuts at the first trip over. It was real work that made men glad to drop the poles at the end of the day. Eight to ten men made up a crew and they could shake a tree in 10 minutes. The new method of Diesel tractor shaking reduces the crew to three and they get 85% to 90% of the nuts in 3 to 5 minutes."



*Newest engine in the Manton, Michigan plant, a 3-cylinder, 180 hp. F-M Diesel. Note Alnor pyrometer and Naylor exhaust connection, upper left.*

# DIESELS FOR MODERN MANTON

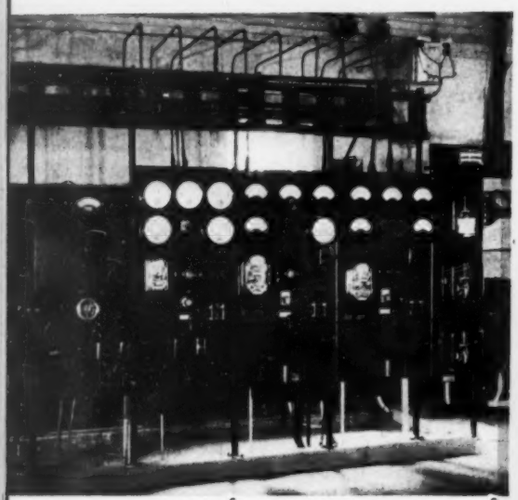
*By* WM. H. GOTTLIEB

THE modernization of rural America has been one of the major phenomena of our era. Radio and the automobile have nearly eradicated the line of demarkation between small town and big town in fashions of dress, thought, recreation, mode of living. Perhaps the greatest modernizing agent of all has been electric power, carrying modern convenience to the rural home. In hundreds of communities electric power is synonymous with Diesel prime movers, for the economy of Diesel engines has made possible the establishment of city standards of rate and service in the smallest villages. Manton, Michigan, with a population of 1,000 has had some form of electric service since 1900, when a tiny steam plant was started to provide DC current for a few hours each evening. In 1904, a Corliss steam engine, with an AC generator, was installed for limited service. When the once-abundant supply of cheap wood was exhausted, Manton found the cost of operating this plant prohibitive and, in 1917, constructed a dam on Cedar Creek. Hydro power was cheap enough but service was dependent on the fickleness of the stream. To obtain an economical and yet dependable power supply, the businessmen of Manton banded together in 1920 and financed the purchase of a three-year-old 100-hp. Fairbanks-Morse Diesel direct-connected to a 72 kw. F-M alternator. The Diesel-hydro combination gave the town its first taste of dependable power at low cost.

This power system, for all its virtues, did not shoot power consumption skyhigh. It took 16 years of steady load development to reach the capacity of then-existing facilities. When expansion was imperative, Manton purchased another Diesel, a modern 3-cylinder, 12 x 15 in., 2-cycle, mechanical-injection Fairbanks-Morse engine, rated at 180 hp. at 360 rpm. It drives directly a 118 kw., 80% pf., 3-phase, 60-cycle, 2400 volt F-M alternator with 5 kw. V-belted exciter. Expansion of consumption went somewhat faster now and, in 1941, the town installed an exact duplicate of the 1936 Diesel. Today, Manton depends entirely on Diesels, for the 50 kw. hydro plant was washed out and the 18.5

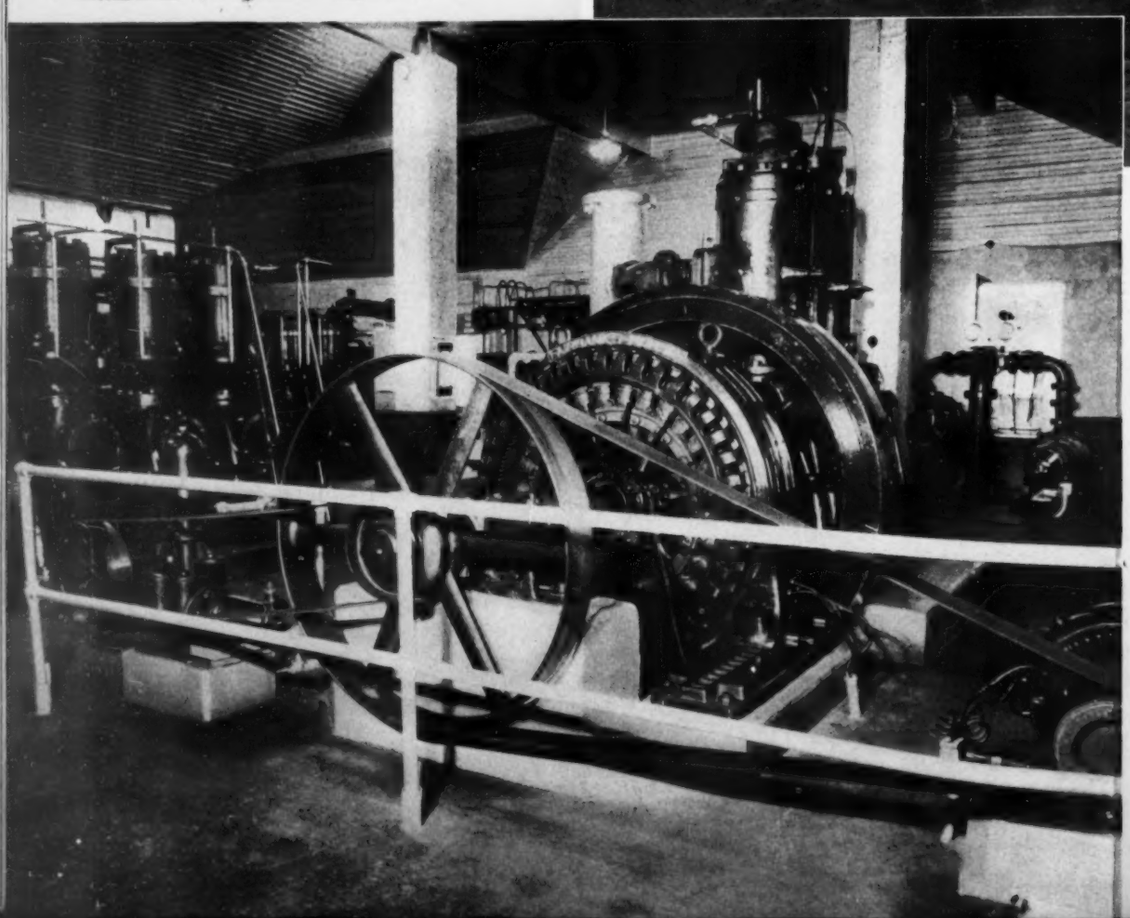
*The neat substantial Manton power plant building. Note Maxim silencer.*

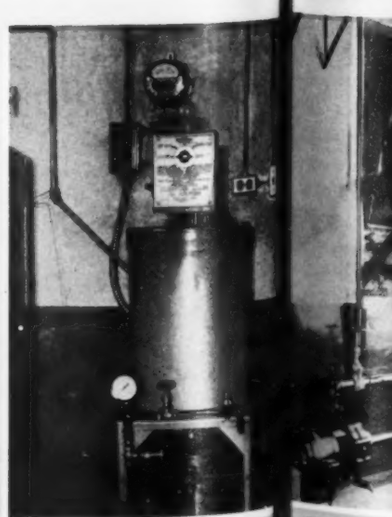
*The 180 hp. F-M Diesel installed in 1938—equipped with Woodward governor and Schwitzer-Cummins radiator, seen in this view.*



*View of the F-M switchboard which mounts G.E., Roller Smith and Weston instruments and Allis-Chalmers voltage regulators.*

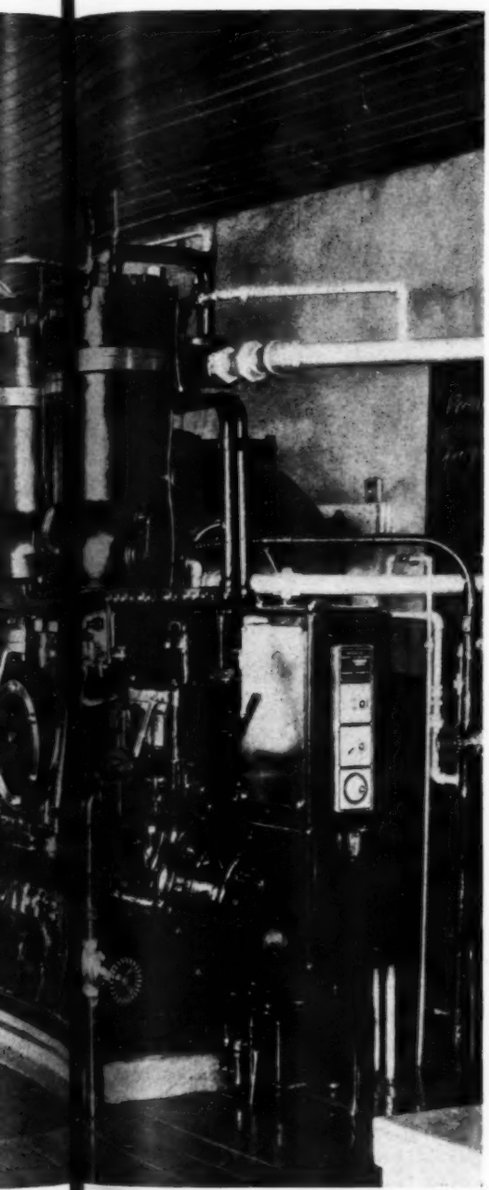
*General view showing all three F-M Diesels. First unit is 100 hp. engine installed in 1920.*

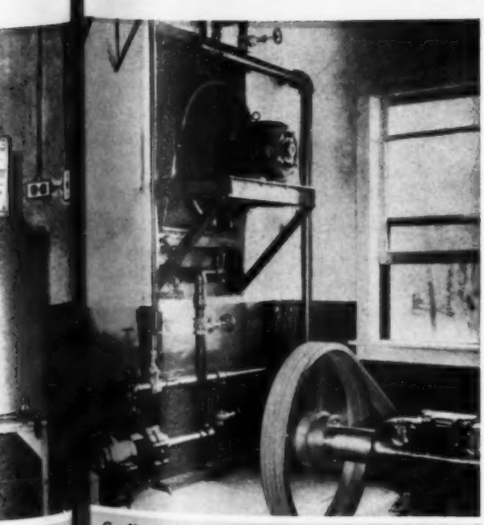




*Youngstown-Miller oil purifier batch cleaning lube for the Diesels.*

Cooling of
F-M circulati
rad





*Cooling of the new Diesel is handled by F-M circulating pump and Yates-American radiator, upper center.*

kw. hydro plant is too small to be useful. Experience with its new Diesels has convinced Manton that it has hit upon a workable success formula.

A low cost per kilowatt-hour in a small town is the triumph of engine economy over the natural disadvantages of the situation. Where production is comparatively small, the unit cost of such fixed charges as labor are correspondingly high. It costs not a cent more to hire an operator to care for an engine generating 750 kw.hrs. in an eight-hour shift than to care for the same engine producing 450 kw.hrs. He can care for a 450 hp. Diesel as easily as a 180 hp. unit. It is an achievement, then, when a town of 1,000 population, consuming little more than 500,000 kw.hrs. a year, can scale rates down as low as 1.5 cents a kw.hr. It is an achievement possible because the Diesel plant produced a kw.hr. for a total operating cost of 1.29 cents.

During the fiscal year ending November 30, 1942, the Manton plant generated 551,850 kw. hrs. The costs were as follows:

| | |
|---|---|
| Fuel and Lube | $3,870.14 |
| Labor | $3,175.00 |
| Maintenance and Supplies | 125.00 |
| Miscellaneous | 100.00 |
| Total Operating Cost | $7,270.14 |

This represents an operating cost of 12.9 mills per kw.hr. Including all fixed charges, with depreciation at 5 per cent a year, the cost is $9,220.00 or 16.7 mills per kw.hr. The expanding load inevitably will reduce the cost per kw. hr. It should be noted that the year described saw only one month of the new engine's operation while the 25-year-old unit ran more than 4,253 hours. The superior performance of the modern engine also will be reflected in lower costs.

Manton bought Diesels for decades of service and plant design affords the engines the desirable protection against impurities in fuel, lube and water. Fuel is delivered by truck and unloaded into a 10,000 gallon tank above ground outside the power house. The fuel then flows by gravity to the 300 gallon day tanks buried just outside the plant. Pumps built into each engine take fuel from the day tanks through filters and meters and deliver it to the F-M injection system. A relay-type governor on each of the larger units regulates the quantity of fuel injected. Despite an operating load factor well below 50 per cent of engine capacity, the 180 hp. Diesels produce 11.3 kw.hrs. per gallon of fuel.

Cooling water for each engine is cooled in a separate Yates-American radiator with motor-driven fan. Each of the 180 hp. units has a motor-driven centrifugal pump to circulate cooling water through the radiator and engine jackets. The old engine has a centrifugal pump belted to the engine shaft. Soft city water is used for makeup and there has been no sign of scale. The new unit was povided with an alarm system which warns the operator if water pressure drops. The alarm panel also holds an Alnor multi-point exhaust pyrometer. Air for these crankcase-scavenging Diesels is cleaned by a pair of Burgess snubber-filters mounted on the engine frame. The plant is close to the center of town with residences just a few yards away and so provision was made for silencing of engine noise. Exhaust gases from each engine vent through individual vertical Maxim silencers outside the building. There have been no complaints from the neighbors, a sure sign of efficient silencing.

Lubricating oil in the crankcase supply is filtered by Purolator units continuously during engine operation. Every 30 operating days, the lube is drained from the engine and its supply tank and cleaned in Youngstown-Miller activated clay purifier. No oil is discarded. Engine cylinders are lubricated by force-feed mechanical lubricators. Lube oil used in the newest unit is Standard of Indiana Nonpareil, the other engines are lubricated with Sinclair Rubilene.

It is significant that the first step in the development of Manton's Diesel plant was financed by the businessmen of the village, for this move opened the way to modernization and expansion of the town's business life. Today, a feed mill, printing plant and four potato houses consume a full third of the power plant's production. Diesels were a good business investment, for they have paid the entire cost of the power system out of plant earnings and returned additional dividends to the town. Profits now amount to more than $7,000 a year. Equally important to the community is the fact that Diesels have given Manton electric services that never fail.

The power system is operated under the active supervision of Superintendent Owen S. Swanson. The town officials responsible for power poilicy are Mayor Charles A. Nelson and Councilmen Lloyd Phelps, chairman of the Water and Light Committee, Walter Nutter, Howard McDaniel, Ray J. Hackman, Dallas Culver and Homer Bever, and City Clerk Leo C. Burns.

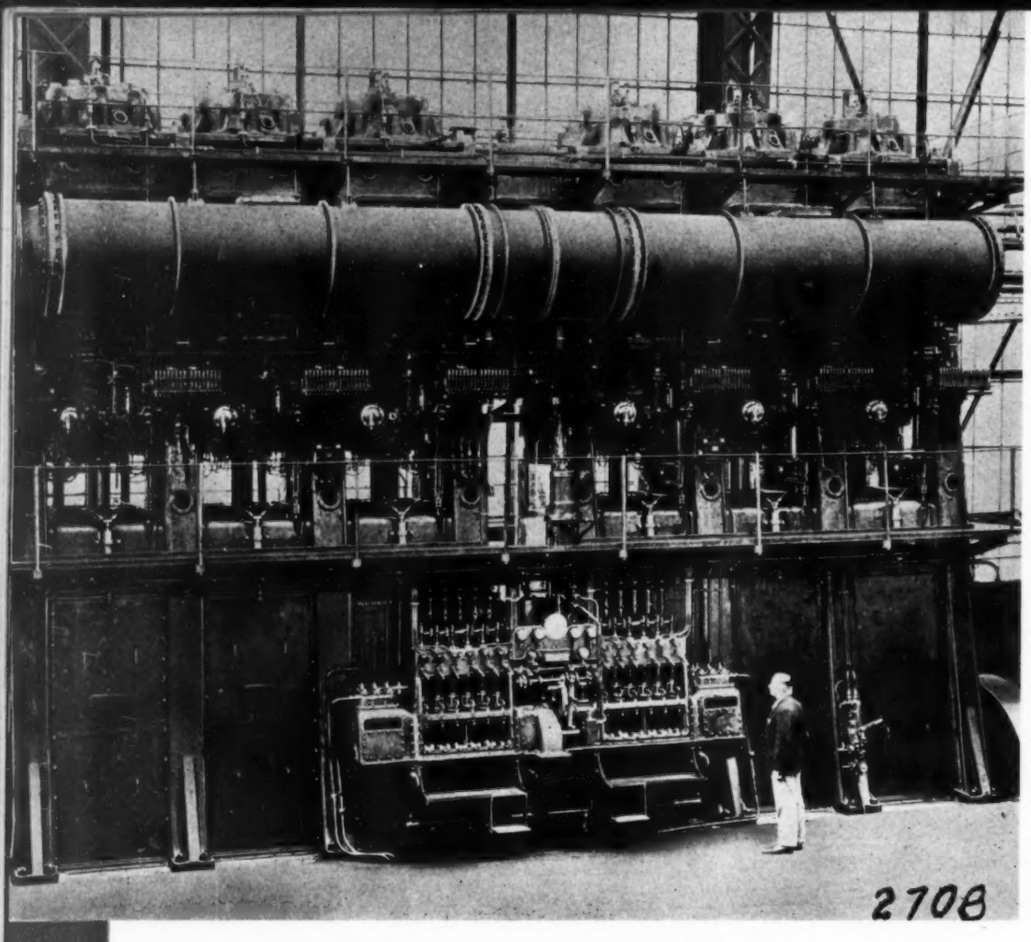
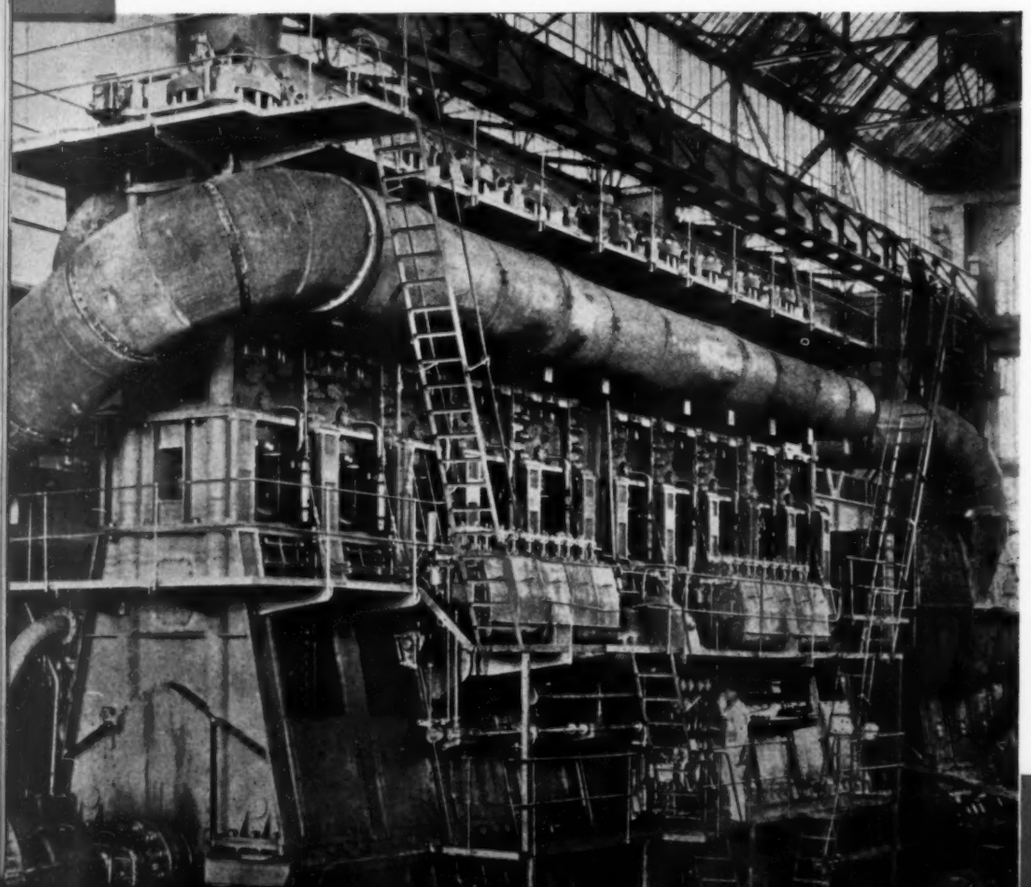



*Fig. 1. A.G.E. double-acting, 2-cycle, six-cylinder, 27-9/16 in. by 47-1/4 in., 4500 bhp. Diesel for the M. S. "Oakland."*

*Fig. 2. One of two 13,000 bhp. Fiat Diesels for installation in the M. S. "Vulcania."*



# HEAVY DUTY DIESEL ENGINES

*By* B. V. E. NORDBERG*

*Editor's Note: The following paper, which was read by Mr. Nordberg before the Midwest Power Conference in Milwaukee, explores fields far beyond the scope of its title, including turbo-charging of both 2 and 4-cycle engines, an enlightening evaluation of the Gas-Turbine and a prophetic view of the future for Diesels. Considerably more than normal space is allotted to reproduction of this work to give DIESEL PROGRESS Readers the benefit of Mr. Nordberg's comprehensive treatment of his material.*

HEAVY Duty Diesel engines are in that class which must operate for protracted periods of time on high load ratings. No satisfactory definition may be set up to include all the limitations affecting the power output of an engine, but we must understand the functioning of the Diesel engine to properly limit it to some such definition as above. The phrase "protracted periods of time" is vague. Industries, however, will request a manufacturer to furnish a heavy duty engine and thereby imply specifying a continuous power flow for a week to six months or more. Continuous flow of power is essential and a border-line case engine that delivers 144 hours of service a week or 720 hours a month while new and then falters is not in that category. Its record must be continuous over a number of years—that is, its performance must include continuous delivery of power for a number of years. It must be reasonably free from forced shutdowns. Continuous operation includes shutdowns at specific periods of time when the engine can be spared, during which a regular course of inspection is made, the purpose of which is the avoidance of forced shutdowns.

* *Executive Engineer, Nordberg Manufacturing Co.*

The engine as such does not fail—it is the details or component parts that are vital. Most of the first Diesel engines built in this country are still running and performing as well as they did when they were started. Certain vital parts have been replaced and so they continue running satisfactorily. The life of such component parts of the Diesel engine is measured in hours of service—that is, actual running time; it should not be measured in revolutions or the miles to drive a ship or locomotive, although this is convenient to the operating personnel who, however, must have a clear understanding of the circumstances surrounding the operation period.

In comparing one type of unit with another, this must be kept clear. There is no point in taking a given engine which at reasonable speed has a satisfactory performance record and upon speeding up, it produces no greater number of revolutions of similarly satisfactory performance. During that period, it may have turned out the same number of kw. hrs. or bhp. hrs., and so maintenance cost based on its output only is not the answer. This figure should actually show a proportionate, or almost proportionate, increase in performance to speed increase, if we are to maintain a standard of the heavy duty Diesel engine. The tendency, however, is to encroach more and more upon this standard in the effort to produce an engine of low first cost and we cannot regard the Diesel engine as having the same obsolescence factor as the equipment with which it is in competition. Since the engine was originally built, there has been little gain in the economy with which it produces useful work from the burning of fuel oil, which cannot be said of power generating equipment operated with steam. In other words, the obsolescence factor based on better performance applies to Diesel engines to a lesser degree than it does to steam plants and therefore the low first cost of the Diesel engine should not drive us too far away from our "standard."

There are in service light-weight, high-speed Diesel engines which serve industries intermittently, a service for which they were designed. Such an engine may be placed in heavy duty service, where it is operated at partial speed or with decreased load and will do pretty well, but it cannot be operated at the high rating of a heavy duty engine and therefore does not come under the definition of a heavy duty Diesel engine. We find that slow or medium speed engines satisfy the definition and such engines therefore are all in the heavy duty class. Fair rotative speeds, with medium piston speed, may be included under this definition as well; however, high speed or slow speed are clearly not definite values, but we can say that 750 rpm. is high speed and 250 is medium, these speeds, however, depending upon the engine size.

The term "Heavy Duty Diesel Engine" must be justified in the knowledge that as a prime mover, it is in competition with steam plants. The comparison, however, is one of life and performance, rather than on the basis of economy alone. The prime mover must be economical, as a matter of course, and its reliability is therefore the criterion which is to determine whether the installation is to employ a Diesel engine or whether it shall resort to other forms of current production. The one factor that has had intensive study of all Diesel engine builders is that of reliability—continuous performance. Continuity of service with sustained loads on the engine is a real measure of its reliability and the Diesel engine is expected to live up to this requirement. Reference to the power cost records of A.S.M.E. sheds much light on this subject, although, unfortunately, we do not have the record of as many plants as we should The rotative speeds of engines have been gradually increased within the last fifteen years and it seems to be an easy solution to take a unit of 150 rpm. and speed it to 175 or 200 rpm. The rate of increase of horsepower in this case will be substantially in direct proportion to the increase in speed. Certain failures of small details may occur after such increase has been made and more robust designs usually correct the difficulty. A further increase in the speed of this same engine will show up further weaknesses and a limit will soon be reached, beyond which an entire redesign is necessary. This sort of development has taken place for some time and it became increasingly clear that some fundamentally new step was necessary. Much, however, has been learned by this simple expedient, the difficulties growing out of it revolving around vibration difficulties, heat stresses and metallurgical development, bearing and lubrication difficulties, etc.

Another step in this development was the use of a greater number of cylinders on one crankshaft and this has led to a careful investigation of vibration difficulties and wear characteristics. New arrangements have been suggested and in this the high-speed aero-engine had much to offer. With large masses in movement, pistons reciprocating vertically have the advantage as to wear characteristics and floor space requirements. V-type arrangements have head room advantages. Combinations of these have been built in small high-speed types and have been suggested in larger units. All such arrangements have been made with the idea of creating as large a power unit as possible. American practice has led to the adoption of the straight line vertical engine and our British neighbors have, in addition, developed an arrangement of a number of horizontal cylinders, built by Crossley Bros. Ltd., of England. All manufacturers have increased the number of cylinders in an effort to produce an inexpensive and

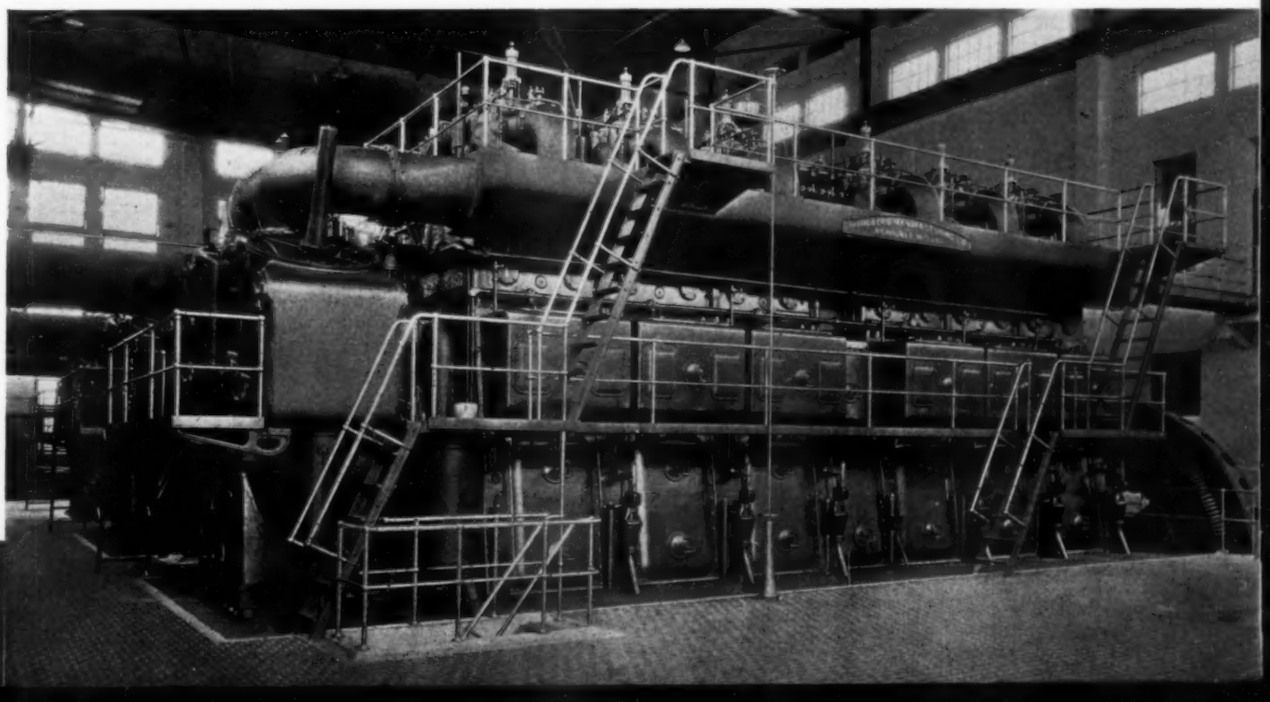


*Fig. 3. Nordberg, Type 6CZ Diesels, 29 in. by 44 in., 125 rpm., 6-cylinder, rated 3750 bhp., direct connected to 2500 kw., 3 phase, 25 cycle alternators.*

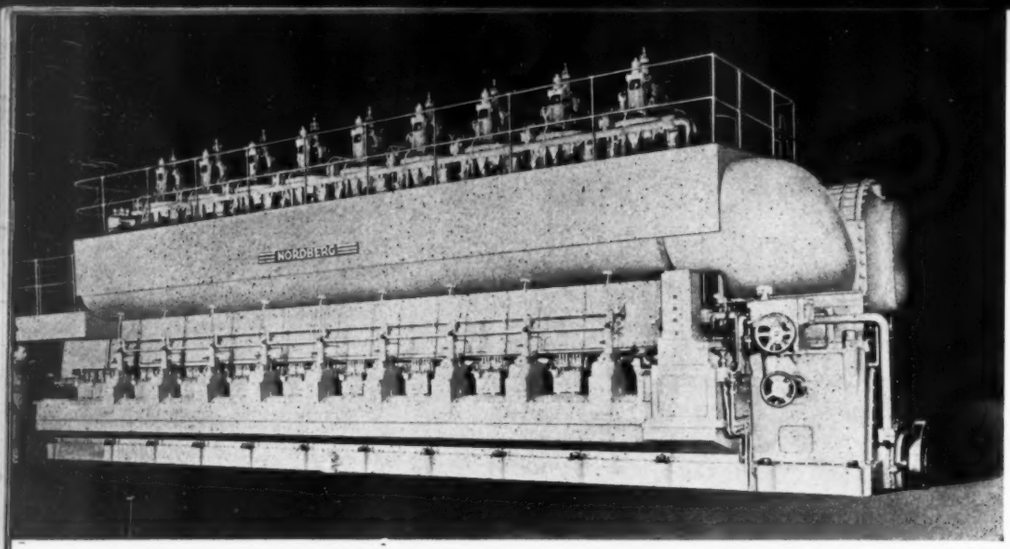



*Fig. 4. A 3600 hp. gas-burning Diesel, of 9 cylinders, 21½ in. by 29 in., trunk piston type operating at 225 rpm.*

competitive unit and this is a recognized means for reducing cost. Engines are being built today with 6, 8, 9 and 10 cylinders in line. Large single, two and three cylinder units have almost disappeared. The use of a large number of cylinders is brought about by the inertia to step into new development and when a manufacturer can offer a unit in six cylinders to do the work of a ten-cylinder engine, the unit having the smallest number of cylinders is usually purchased. When such a situation arises, we find many inconsistencies of argument and not a little embarrassment, but we may establish a basis upon which to approach the correct solution in recommending power units for large plants.

However, the increase of speed and the number of cylinders lead to a common result in all engines and we find that the engine user has also had a hand in this development. Power plants have expanded and on that account have demanded a general increase in the size of the units. In general, the use of a greater number of cylinders has been advocated, that is, the plant increase was made by adding engines of the same size, or more cylinders of the same size per engine. An effective argument for this arrangement was the use of a common set of spares for all engines. . . .

. . . . We find many attempts made to break away from the large massive, slow-running engines in European development by such outstanding manufacturers as Sulzer Freres, Winterthur, Switzerland, M.A.N. of Germany, FIAT of Italy, Burmeister & Wain of Denmark, and others. These manufacturers, with their large experience, were not so greatly hampered as we in this country by a desire for simplicity. (Fig. 1) The Oechelhauser and the Junkers opposed piston engines found a stronger backer in the Doxford Company of England and this development was carried into this country by the Sun Shipbuilding Company. Burmeister & Wain made partial use of this scheme in providing a large piston valve of limited stroke in place of one of the opposed pistons. Harland & Wolff of England took up this development and our company proceeded with it in this country.

M.A.N. strove to obtain large power units with low weight and developed the double-acting engine. Burmeister & Wain developed many of these engines also and it was carried on in this country by the Worthington Pump & Machinery Corp., under the leadership of Professor Lucke and Mr. O. E. Jorgensen, formerly of Burmeister & Wain, these units being built principally for marine use. An important double-acting M.A.N. development was taken up in this country by The Hooven, Owens, Rentschler Company, Hamilton, Ohio, who built both marine and stationary engines.

One of the largest engines designed by M.A.N. and built by Blohm & Voss of Hamburg was a 15,000 bhp. engine, built for the Electrical Works of Hamburg. This engine had a cylinder diameter of 850 mm. and turned 94 rpm. FIAT Company of Italy developed the double-acting engine for marine use in the Italian ship *Vulcania*, this engine having ten double-acting cylinders, the cylinder bore being 29½" with a stroke of 49", running 128 rpm. (Fig. 2) This engine was capable of developing a maximum continuous load for two hours of 18,000 bhp. by increase of speed and M.E.P.

Sulzer Freres, of Winterthur, and Carels Freres, of Ghent, Belgium, both turned out experimental cylinders having a diameter of one meter, but no engine having this cylinder diameter was built for practical use. A double-acting, four-cycle engine was built by Burmeister & Wain and installed in the motorship *Kungsholm* developing 8500 ohp. in six cylinders of 840 mm. dia. x 1500 mm. stroke and running 115 rpm.

All this development has its practical use as much of it was carried into this country where two-cycle engines having cylinder diameters of 29" and 30" have been built in substantial numbers, (Fig. 3). However, large cylinder dimensions are not always the way to low cost, although building costs are at a definite advantage in certain shops in this country able to economically handle large parts.

Large Diesel power plants, have, however, found little favor in this country. Prior to the beginning of the present war, the world's largest Diesel plant was located in Shanghai, China, having a plant capacity of over 50,000 bhp. Five years ago, the United States boasted of a Diesel plant located at Vernon, California, which had a capacity of 35,000 bhp., these engines all being double-acting. However, there is now in operation in this country a plant of 120,000 bhp. in gas engines, of which 65,000 bhp. are in Diesel engines, (Fig. 4). A plant of this magnitude should logically have its power generated in as few cylinders as practicable. As the present emergency could not wait for such development, there were installed two types of engines—a small unit of ten cylinders each and a medium size unit of nine cylinders each. The magnitude of the maintenance job before the operating personnel is not yet realized and the inspection periods themselves will require continuous work throughout the year, if the best results are to be had.

Engines of 6,000 bhp. per unit could readily be furnished without going to complicated designs and effect a saving of 480 cylinders in that plant. The rotative speed of the engine would be in the higher brackets for a heavy duty engine; it would have a lower fuel and lubricating oil consumption, and be less costly to maintain.

Comparing the present heavy duty Diesel engine with its improved combustion, lighter weight parts and higher speed, with the massive construction of some years ago, we see that the present engine occupies much less space, is easier to transport and is more readily serviced, but still has cylinder dimensions of its older brother. Costs of the engine have shrunk as well. Many developments have taken place in the combustion space and fuel distribution and the M.E.P. have been raised. The ultimate and extreme output cannot be utilized in the heavy duty Diesel engine. Its exhaust temperature is maintained low, its cooling is adequate and its lubrication always clear and sumptuous. Fuel filtering, air cleaning and a coolant free from impurities; all these improvements have had much thought and lead to more continuous power flow. However, fuel oil still has conti-

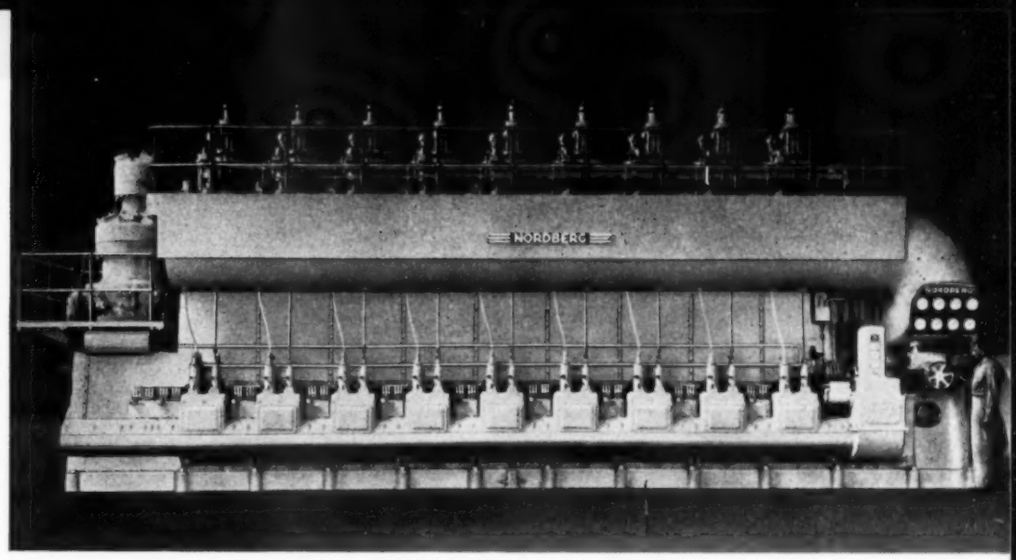



*Fig. 5. An injection Diesel, rated 3850 hp. at 225 rpm.; 21½ in. bore, 31 in. stroke.*

tuents which must be removed to enable proper burning in an engine having solid injection equipment. A fixed cetane number must be maintained and while there is no difficulty to obtain such fuel oils, there, nevertheless, may be available a heavier and less refined fuel at a lower price which can be advantageously used. For this purpose, an air-injection engine is offered and still available, (Fig. 5). The fuel consumption of this engine is about 8 to 10% higher, but fuel prices may be as much as 15 to 25% lower per gallon. Where there is only natural or artificial gas available, or where it is offered at a low price, a heavy duty Diesel engine is now available to handle it.

In some localities provisions must be made to burn either fuel oil or gas, where the flow of the latter may be interrupted at times. For this purpose a convertible Diesel engine is available which can readily be transposed from an oil-burning engine to a gas-burning engine, or vice versa. Methane gas from a sewage disposal plant can be employed and its quality and quantity may vary sufficiently to require such flexibility where the gas is burned in a prime mover. The ability of a Diesel engine to burn such gas moves its use farther into the coal fields where artificial gas may be manufactured cheaply. But with all this development, the struggle for less weight and higher concentration of power in the heavy duty Diesel engine continues.

It was many years ago that Dr. Alfred Buchi conceived his idea of power development by expanding exhaust gases from a Diesel engine through a turbine, both of these driving a blower, and all mounted on the same shaft, the latter being used to supercharge a Diesel engine. This development was adopted in comparatively recent years with slight changes and is now widely used to enhance the power output of the four cycle engines. This method of supercharging has increased the value of the four-cycle engine to a substantial degree and again makes it a serious competitor of the two cycle engine. (Fig. 6) However, it is largely used for purposes other than for heavy duty work, but its progress into that field is predictable. Many marine and stationary engines are now in operation using the turbo supercharger. It has definite advantage for operation at high elevation and places the smaller and medium speed engine nearer the heavy duty field. More experience with this equipment is still necessary to determine what its life may be, although it has operated a sufficient length of time to give it much promise.

We are now apprised of the development of Sulzer Freres, of Winterthur, covering the supercharging of a two-cycle engine and much publicity of this has recently been spread. This scheme is also old, having been conceived by an American, George Curtis of Curtis Turbine fame, and we may expect the proper development along this line in the United States, as we have many two-cycle Diesel engine manufacturers who will have to maintain the position of their product. This development will further decrease the weight and cost of the heavy duty Diesel engines and will place smaller and higher speed engines in this field. Development must, however, precede the introduction of this arrangement, but it has now been thrust upon us and we will find many who will accept it as a necessary step toward further progress. Some differences in operation from the Buchi arrangement exist and may be briefly mentioned here. The exhaust gas temperature of the two-cycle engine is lower than that of the four-cycle engine. Scavenging air is necessary during the operation of starting the two-cycle Diesel engine and a scavenging pump must be supplied. This unit furnishes scavenging air immediately upon the start. As the unit speeds up, a gas turbine located in the exhaust line also speeds up and its power is returned directly to the crankshaft, thereby making use of the energy in the exhaust gases. During this time, the exhaust gas pressure is increased to a point where its pressure and flow through the exhaust turbine is balanced. As this occurs, the scavenging pressure automatically rises and the engine operates, as it were, at a depressed elevation—that is, it is being supercharged. Comparing this process with the supercharging of four-cycle engines, a slight difference will be noted.

The gas turbine is a natural development, in view of the work already done by Dr. Buchi and Sulzer, and the need of such units as an auxiliary to a Diesel plant is obvious. As an independent prime mover or power producer, it leaves much to be desired, but it finds practical use in some industries. It is of primary advantage as a second stage in expansion of burned gases. Its thermal efficiency is low and such improvements or auxiliaries as it may require to bring its level nearer the Otto cycle efficiency are available for use in Diesel engines. Its low efficiency is caused by the relatively large amount of negative work which must necessarily be imparted to the air before it can receive the heat by which it expansively performs useful work. The effective output of the turbine is the difference between the power input to a compressor and the power output of the turbine and both of these are very large quantities. A comparison of the relative thermal efficiencies of the various types of internal combustion engines may be interesting:

| | *Thermal Efficiency* |
|---|---|
| The gas turbine | 15-18% |
| Otto cycle | 20-22% |
| The Diesel cycle | 33-35% |
| A special Still Diesel Engine with steam and heat recovery | 40.5% |

If we look at the gas turbine as a Diesel engine auxiliary unit for supercharging it, the unit has definite value and a great future. The heavy duty field, however, is its smallest field, but is nevertheless one which will use the gas turbine in fair sized units. It enhances the power output of the four-cycle engine by about 50% and the two cycle engine by about twice its original rating, the Diesel engine rating being based on 65 lbs./sq. in. M.E.P.

Returning to the Heavy Duty Diesel Engine development, we may look for further progress in increased speed. It is not clear what the limits of speed may be, but the heavy duty Diesel engine is not a high-speed engine. As the speed limits of the heavy duty engine increase, the speed limits of the high-speed engine will undoubtedly increase with it, so there will al-

ways be a relative difference between the two types. The line of division of the two types is quite considerable. The ability of the engine to deliver a high rate of power continuously is measured as some function of its speed. It must be maintained sufficiently low so that the maintenance of the engine may be low and so that the inspection periods are not too frequent.

Both of these items are reflected in the cost of making power. To further complicate this problem, solid or mechanical injection has been adopted. This is not a new development; it is in fact the oldest form of fuel injection. Recent manufacturing standards have brilliantly solved the problem of nozzle and pump construction and we can today use solid injection very successfully. However, with the increase of speed, the phenomenon of combustion in the solid-injection engine changes. The engine may be operated with low initial pressures at low speed and the advantageous affects of this will be to reduce the cylinder and piston ring wear, as well as bearing difficulties. It is also clear that with a lower initial pressure, a lighter engine may be realized. Better fuel economy at lower speeds is possible and in this we must remember we are discussing a Diesel engine built for moderate speed. We can set limits for rotative speeds in relation to engine stroke or piston speed and when these limits are exceeded, some sacrifice is made in the life of cylinder liner and rings. A piston speed of 1000 or 1200 ft./min. brings about good results and confidence in higher speeds must be established by facts. There will doubtless be further increases in the future.

Developments tending to omit further losses in the Diesel engine, as, for instance, that which is chargeable to scavenging, have been brought about by such developments as that of Kadenacy and others. This particular arrangement, however, may be applicable principally to use with high-speed engines, but its principles may be applied to large heavy duty units. Some interesting data on this application have been made use of by the writer in increasing the capacity of existing scavenging pumps by as much as 30%. In one Navy Yard compressor plant, the intake pipe was accidentally tuned and raised the capacity of the unit 12%. Burmeister & Wain are making use of this principle in exhaust pipe disturbances, but the Kadenacy experience holds forth greater possibilities by the elimination of the scavenging pump.

We have advanced the heavy duty Diesel from its 350 to a possible 150 lbs./bhp. The cost of the engine through the many years has decreased to about one-half. Piston speeds of 700 ft./min. are now over 1100 ft./min. The rotative speeds of larger engines have increased from 165 rpm. to 225. Fuel consumption has been lowered from .45 lbs./bhp.hr. to .37 lbs./bhp.hr. Lubricating oil consumption has remained constant and maintenance in many engines has not been increased. Metallurgy has changed greatly and new metals are being used, this problem being temporarily disturbed. Even this disturbance will undoubtedly bring much new to light. Auxiliary equipment has improved and noise and vibration have received close attention, with great gain in both fields. New fuels have been added to those burned by the Diesel engine, including natural and artificial gas, and solid fuel, too, may shortly be added to the list. Large heavy duty units have not been produced in this country in recent years, but this field shows promise. The Diesel engine has much territory yet to invade and the public is ready to receive its benefits.

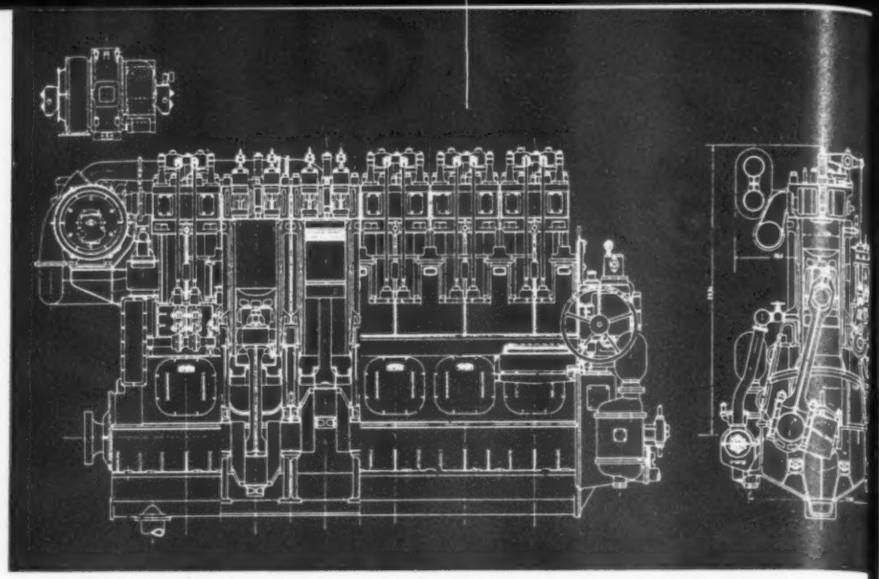


*Fig. 6. Side and end sections of a 6-cylinder, 370 mm. by 600 mm., 4-cycle Tosi Diesel, rated 720 bhp. at 225 rpm., fitted with Buchi exhaust gas turbocharger.*

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# DIESEL ENGINEERS TO HOLD THIRD WARTIME MEETING

COVERING current problems of operation and design as well as recent developments that will influence the internal-combustion engines of the future, the 17th National Oil and Gas Power Conference tentative program just released shows a wide variety of interesting papers. This meeting, the third to be held in wartime, will take place May 8-10 at the Mayo Hotel, Tulsa, Oklahoma.

Current problems to be discussed include control for aviation, marine and railroad engines, governing of engine-generators in parallel, controls for pipeline engines, operation of pipeline stations, aircraft-engine maintenance, and exhaust system design. Looking to the future, other papers will cover gas-turbine prospects, developments in turbocharging, and design progress in Gas-Diesel engines. Present plans for inspection trips include a visit to the maintenance shops of one of the large pipeline companies and possible visits to a bomber assembly plant and an oil refinery.

Other highlights of the meeting will be the All-Engineers Luncheon on Monday, May 8, the informal banquet that evening and the All-Engineers Meeting on Tuesday evening, May 9, at which an unusually interesting motion picture on airline maintenance will be presented in connection with a talk on the same subject. A record number of manufacturers will display the latest designs in engines and accessory equipment at the exhibit held in conjunction with the Conference. All indications point to a large attendance at this important wartime meeting, so if you plan to attend be sure to arrange for hotel accommodations early.

**17th National Oil and Gas Power Conference**

**Tentative Program**

*MONDAY, May 8*

REGISTRATION ..... 10:00 A.M.

ALL-ENGINEERS LUNCHEON ..... 12:00 N.

SESSION ON GAS TURBINES AND SUPERCHARGING ..... 2:00 P.M.

"Present Status and Future Prospects of the Combustion-Gas Turbine" by S. A. Tucker, Associate Editor, POWER, New York, N. Y.

"Recent Developments in Turbochargers" by C. F. Harms, Manager, Supercharger Department, Elliott Company, Jeannette, Pa.

INFORMAL BANQUET ..... 7:00 P.M.

*TUESDAY, May 9*

SESSION ON POWER PLANTS ..... 9:30 A.M.

"Design Progress in Gas-Diesel Engines and Plants" by Robert Cramer, Asst. Chief Engineer, Nordberg Mfg. Co., Milwaukee, Wis.

"Designing Exhaust Systems for Best Engine Performance" by Ralph L. Leadbetter, Burgess-Manning Co., Chicago, Ill.

"Panel Discussion on Operation of Engines in Pipeline Service," lead by J. G. Norton, Chief Mechanical Engineer, Magnolia Pipeline Co., and other leading pipeline engineers.

INSPECTION TRIPS ..... 2:00 P.M.

SESSION ON AIRCRAFT-ENGINE MAINTENANCE 8:00 P.M.

"Airline Maintenance" (illustrated by a motion picture) by R. A. Miller, Supt. of Overhaul, American Airlines Inc., New York, N. Y.

*WEDNESDAY, May 10*

SESSION ON ENGINE CONTROL ..... 9:30 A.M.

"Control for Aviation, Marine and Railroad Engines"—papers by W. C. Trautman, Bendix Aviation Corp., M. A. Edwards, General Electric Co., and R. R. Stevens, Westinghouse Air Brake Co.

SESSION ON GOVERNING ..... 2:00 P.M.

"Analysis of Frequency Characteristics of Governors, Drives and Engine-Generating Sets" by W. E. Skinner, U. S. Engineers, North Atlantic Division, New York, N. Y. and P. L. Giering.

"Hydraulic Control Methods for Pipeline Engines" by J. R. Polston, Engineer, Stanolind Pipeline Co., Tulsa, Okla.

# "A RECENT DEVELOPMENT IN DIESEL FUEL PURIFIERS"

*By* R. L. GREGORY*

IN LAST month's issue of DIESEL PROGRESS, the writer, in a discussion on "Diesel Fuels," dwelt at some length upon the impurities and foreign matter found in many of our present day fuels, and also upon the difficulties experienced in many plants using such fuels and also fuels not adaptable to their particular units.

Even in normal times the problem of dirty fuel is always present in some plants due to lack of facilities and care in handling the fuel supply.

Regardless of the amount of care taken by the refineries and vendors of fuel oils, there is bound to be a certain percentage of impurities and non-combustible matter in all fuels. This percentage depends a great deal upon the handling of fuels in transportation, and the condition under which storage and handling facilities are kept and operated.

For many years manufacturers of purifying and fuel handling equipment have had a fertile field for their products. But under present conditions, they have realized that much more of this foreign matter could be removed if they could improve their equipment. And so with an eye to the future, most of them have, during the past few years greatly improved their lines of fuel handling equipment.

Many of us perhaps, feel that we are using fuels and lubricants practically free from these foreign elements and are satisfied to go along from day to day, unaware of just what the real conditions are until suddenly we find our units in trouble, with worn pumps, check valves, clogged up lines, etc. But if we could take specimens of our fuel and analyze it under a powerful microscope, we undoubtedly would receive quite a surprise. To illustrate this point refer to the pictures in Figures 1 and 2.

These photographs are actual enlargements, increased one hundred times, of specimens of fuel oil, which have been furnished us through the courtesy of a leading manufacturer of fuel and lubricant purifiers. Fig. 1 shows a specimen of crude fuel oil, taken directly from a storage tank. Note the many small particles of foreign matter present, most of which is non-combustible as well as of an abrasive nature. Consider then the amount of this foreign matter which can pass into your fuel lines, fuel pumps, through the check valves and atomizing apparatus, with the thousands of gallons of fuel consumed monthly by your units.

Of course all this foreign matter will not reach the atomizers and be injected into the engine with the fuel. Much of it will cling to the walls of the fuel lines, lodge in fittings, and various other places in the fuel lines. Many units are equipped with common strainers which will remove a certain percentage of it, but even then, much of it passes through into the working parts of the unit, to get in its deadly abrasive action on close fitting parts.

This is a condition which many manufacturers of filtering and purifying apparatus are successfully eliminating by the use of improved types of fuel purifiers. The results obtained in fuel purification is evinced by the specimen shown in Fig. 2 which is the same crude oil after passing through one of these purifiers. Note the almost complete absence of foreign particles.

The illustrations are educational in that they portray what really is suspended in apparently clean fuel oils. For years past, manufacturers of purifying apparatus have been developing more efficient equipment and many efficient purifiers are now on the market for the handling of lubricants. These new type products embody simplicity of design, are fully automatic, once put in operation, heating the oil by various means. The temperature of the oil is controlled by means of a thermostat which can be set at any desired range.

Modern units require but little additional piping as they can be conveniently installed in any fuel line, but preferably between the transfer pumps and the day tanks. A bypass line from the suction to the discharge side of the filter or purifier, enables you to recharge the purifier, when necessary without any delay in plant operation. Beyond this there is little attention necessary. One other convenient feature of the new purifiers, is that all moisture settles to the bottom and can be periodically blown down, through a blow down line connected to the lower compartment. Clean fuel means more efficient operation, less maintenance to equipment, such as fuel pumps, check valves, atomizers and other expensive parts, and a great saving in man hours.

* *Chief Engineer, Municipal Water and Light Plant, Hillsdale, Michigan.*

*Fig. 1. Enlarged 100 times: Crude fuel oil from storage tank.*

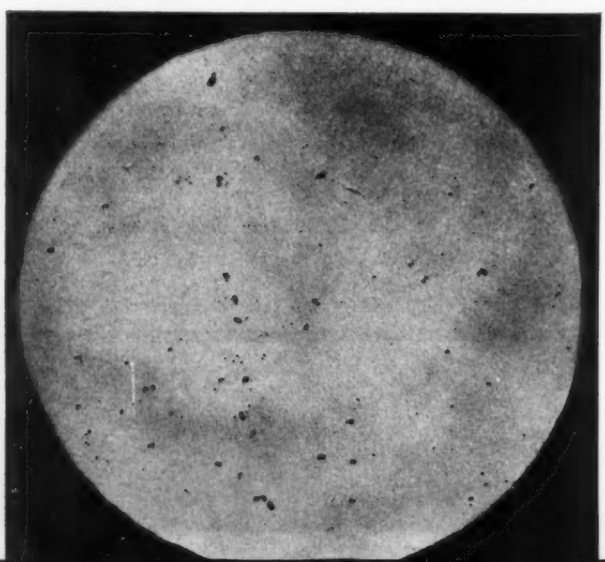
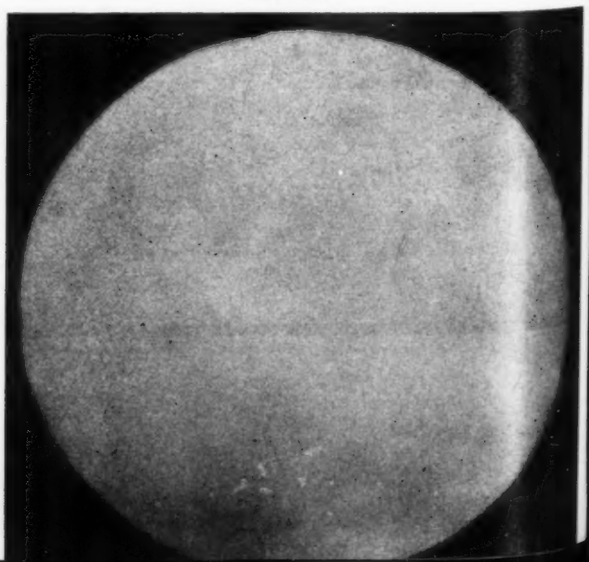


*Fig. 2. Same crude fuel oil after passing through a modern purifier.*



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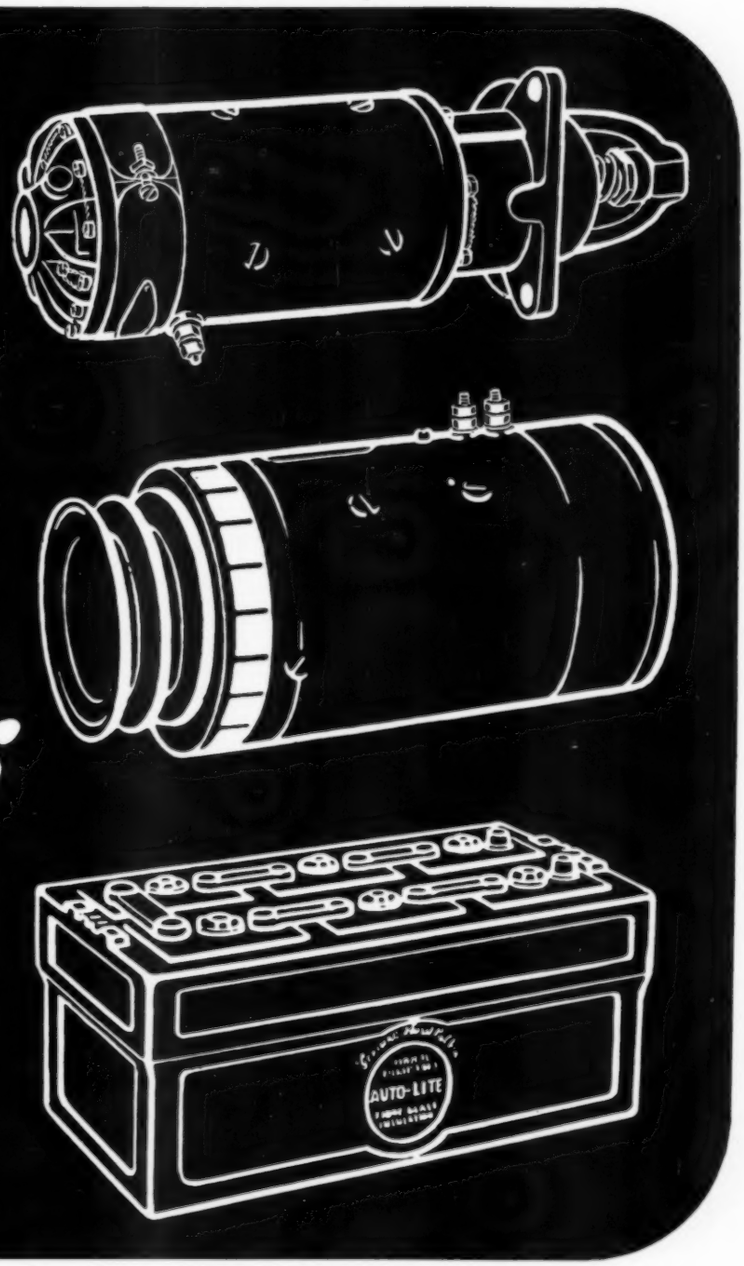


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# Exchange Your Diesel Maintenance Ideas

## RECLAIMING DIESEL CASTINGS BY WELDING

*Conducted by* R. L. GREGORY

*Editor's Note: In this department we provide a meeting place where Diesel and Gas engine operators may exchange mutually helpful maintenance experiences to keep our engines in top condition. Mr. Gregory edits your material and adds constructive suggestions from his own wide experience. This is your department—mail your contributions direct to DIESEL PROGRESS.*

THE following contribution comes from Mr. Carl Guth of the Guth Welding Works of McPherson, Kansas who has had many years of experience in this type of work reclaiming and reconditioning large and small Diesel Castings. This department would be glad to hear from any of our readers who have had experiences with this type of maintenance and repair.

Much can be accomplished in the successful reclamation Diesel cylinder heads by welding. Figures 1 and 2 show the general design of certain types of cylinder heads, and the cracks in these heads where failure often occurs. In attempting to weld breaks of this nature, consideration must be given to the causes responsible for such breakage.

In operation, the exhaust gases pass over these surfaces as the exhaust valve opens, causing this area to be heated and to expand. The whole casting being held firmly in place, and the outer part of the casting being cooler, causes the inner area to crowd together, and become upset, and like the weakest link in a chain, the cracking eventually occurs at this weakest point. Oftimes this condition can develop in a short period of time, for instance, when there is an insufficient amount of cooling agent passing through the cooling system, or it may develop over a period of months or years, for the reason that iron grows when subjected to heat. So the condition can develop slowly as well. Then too we must remember that there is a good deal of movement in this particular area, due to expansion and contraction.

In preparing castings of this nature for welding, all parts such as valves, valve stem guides, studs, cleanout plates, injector parts, etc., should first be removed. We must also bear in mind, that where molten metal is deposited, it contracts as it cools and solidifies, thereby causing a tremendous amount of hanging strain in the weld. This makes it imperative that castings to be welded be preheated.

There are several preheating methods that can be used, but one must be used which can be controlled, since the casting must be preheated in such a manner that the metal itself will not have uneven growth, but will expand evenly. At the same time it must be remembered that the length of time the casting is to be kept hot should be held to a minimum. Castings do not necessarily have to be heated slowly, the trick being to apply the heat in the proper places first. For instance you may pour boiling water over the outside surface of a drinking glass first and then fill it without disastrous results, but if you try to fill it with boiling water, without heating the outside surface first, the results are often a broken glass.

Heat should be applied to the outer surfaces first and then maintained slightly in advance of that applied to the inner surfaces, but care should be used in keeping the temperatures in close relationship. Heating must continue throughout welding operations. "Cherry Red" heat is hardly sufficient, "bright red" is about correct, while "salmon color" is too hot, because at this temperature rapid growth occurs with heavy scaling. In preparing the crack for welding, the oxy-acetylene flame should be used. This method has an advantage over chipping or grinding because the burned metal can be removed far enough back to reach good fusible metal as a base.

In making a repair of such castings as shown in Figures 1 and 2, under no circumstances should any welding metal be used, that does not have the same coefficient of expansion as the parent metal. I have often seen welders try to use bronze in these cases, but the ratio of expansion between bronze and cast iron is two to one, therefore it can be seen that where intense heat would be applied to the bronze as it would be when the unit was operating, the expansion would be unequal in relation to the cast iron.

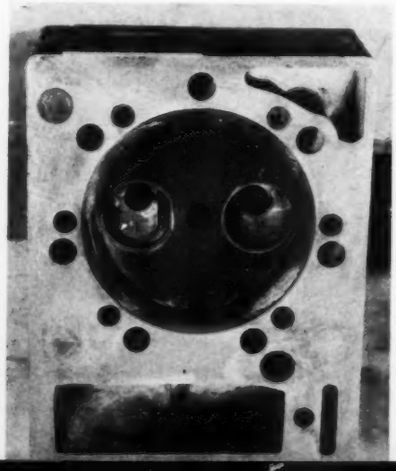
False valve seats are often installed to cover a crack or to repair a badly worn valve seat. This is false economy, since under severe operating conditions these become loose and cause blowby and burning of the head and the valve itself. Where these are found, they should be removed and built up with weld metal almost to gauge, then topped with some satisfactory metal which will resist wear and corrosion.

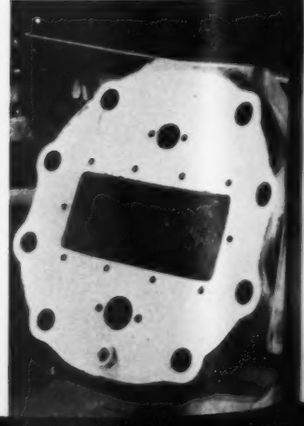
Upon completion of the welding job it is highly important that a thorough examination be made of the interior of the casting, to see that all scale is removed from the inner metal surfaces, so that the cooling agent will contact the metal itself, otherwise the best kind of a repair job would be short lived. Descaling may be accomplished by using special shaped chisels in either a pneumatic or electric hammer, and in some instances can be removed by using acid. However acid must be circulated so that the more conjested areas get a constant supply of fresh acid. After acid is used the casting should be immersed in a hot alkaline solution to drive all acid from the pores of the iron.

Figure 2 shows a heavy engine head, with cylinder cast integral, which had cracked on the outside. The question is often asked "Why do some castings crack externally rather than internally?" In this case the weaker part of the casting is the external part, and the heat applied to the

. . . . *And now please turn to page 75* . . . .

*Figs. 1 and 2. Showing cracks in two types of cylinder heads.*





*Figs. 3 and 4. Views of the same after being repaired by weldi*

*Official U. S. Army Signal Corps Photograph*

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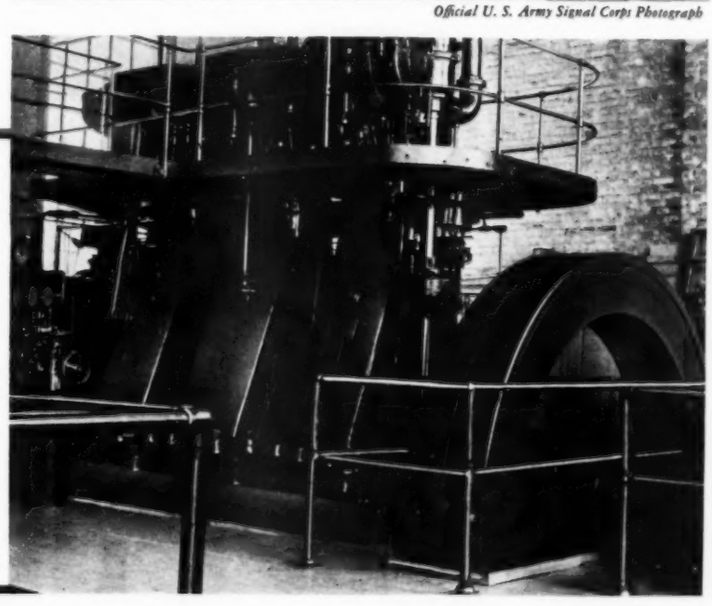

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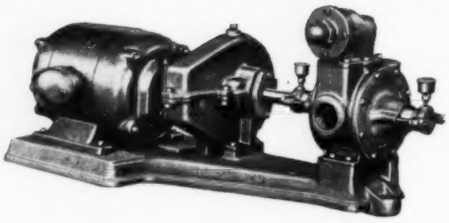

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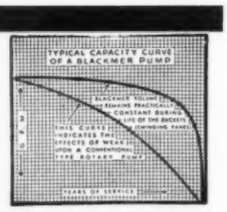
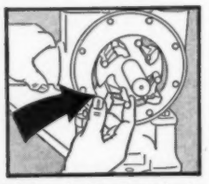
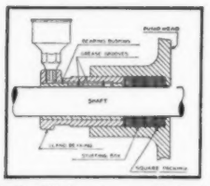
BLACKMER PUMP COMPANY
1964 Century Avenue - Grand Rapids 9, Mich.



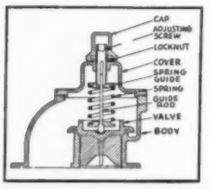

1 The curve shows the sustained capacity of Blackmer pumps. 20 years of service is not unusual. Compare this with a conventional type rotary.



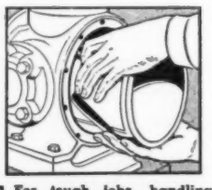
2 When the "buckets" (swinging vanes) finally wear out, this simple replacement restores the pump to normal capacity. It's a 20-minute job.



3 Double-bearings eliminate shaft-whip and provide exceptional rigidity. The bearings are located outside the pump casing, away from the pumpage, protected by packing.




4 Built-in relief valves will by-pass the entire capacity of the pump without shock or end-thrust. This gives positive protection to the pump. Valve operation is quiet—no chatter.



5 For tough jobs, handling corrosive or mildly abrasive liquids, Blackmer pumps are furnished with removable liners. When finally worn out the liner is replaced and the pump restored to normal capacity. This saves the cost of a new pump.

BLACKMER Rotary PUMPS
"BUCKET DESIGN"—SELF-ADJUSTING FOR WEAR

## Scott Appointed Sales Manager Enterprise Engine Division

THE appointment of E. B. Scott to the position of Sales Manager of the Engine Division of the Enterprise Engine & Foundry Co., is announced by C. G. Cox, vice president of the concern. Prior to his promotion, Scott was manager of the repair and maintenance division, and assistant to Cox.

In making the announcement, Cox stated, "The appointment of Scott is in line with the Enterprise policy of selecting for executives only men with a broad and practical knowledge of the industry. It is our firm contention that before a sales or service manager can adequately serve our customers, he must have an actual working knowledge of engine operations. Scott fills this qualification admirably." Scott's experience includes eight years with Hall Scott Motors and three years with the Menasco Manufacturing Company of Los Angeles.

*E. B. Scott, sales manager of the engine division of the Enterprise Engine & Foundry Company.*

Enthusiastic over the increasing importance of Diesel engines in all fields where the power requirements are high, Scott's new responsibility will be the furthering of Diesel engine use in the post-war era.

## Gray Marine Wins Its Second Star

THE Gray Marine Motor Company was recently notified by Admiral C. C. Bloch of the U. S. Navy that the company has been awarded a second star for its Army-Navy "E" flag, for meritorious services. The original award, announced in December of 1942, was granted to the Diesel Engine Division, Gasoline Engine Plant, and Shipping Division. The company has been a large producer of Marine Diesel engines, used in the landing craft, and of gasoline marine engines for various wartime applications.

# *This will take a man higher even than a P-51.*

THIS scientific apparatus looks quite earth-bound.

But, for experimental purposes at least, it can take a man higher than any aircraft ever built.

It is Sperry's new High Altitude Laboratory, constructed through the cooperation and assistance of our Government, and dedicated to the service of our Country in memory of Frederic Blin Vose, a Sperry engineer who lost his life in the performance of his duties in the war effort.

This laboratory helps find the answers to questions like these:

**How does man react in the stratosphere when the sub-zero cold bites through his heated flying suit? Will an instrument that works perfectly at 2000 feet, "conk out" at 40,000 feet?**

The laboratory can mechanically simulate atmospheric pressures equivalent to those met at altitudes over 45,000 feet. It duplicates temperatures as low as 87 degrees below zero Fahrenheit.

This permits the testing of flight instruments and the reactions of men who use them under atmospheric and temperature conditions virtually identical with those met 8 miles up.

Testing the *combination* of man and instrument in this laboratory will result in better protection for the lives of our military and naval flyers, and makes possible improved instrument design and more efficient operation.

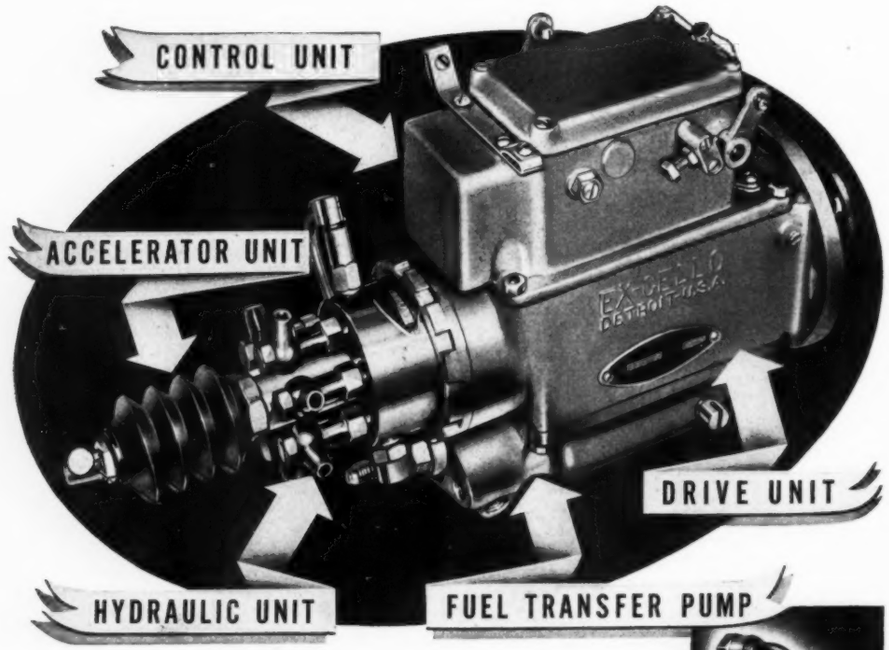
Experienced engineers and a medical staff, trained in the technique of the physiology of high-altitude flying developed by the Mayo Clinic and the Medical Departments of the Armed Forces, direct the Sperry laboratory. This laboratory serves other war manufacturers as well as our Armed Forces.

It is Sperry's hope that the tests and studies of man and his instruments in this laboratory will make possible the development of the perfect man-instrument team that will function in complete harmony in the frigid blue of the stratosphere.

## Sperry Gyroscope Company INC.

BROOKLYN, NEW YORK  DIVISION OF THE SPERRY CORPORATION

GYROSCOPICS • ELECTRONICS • AUTOMATIC COMPUTATION • SERVO-MECHANISMS




# EX-CELL-O
## *Replaceable Unit* Construction Provides Many Advantages

Ex-Cell-O Nozzle and Holder Assembly

The Ex-Cell-O Diesel Fuel Injection Pump is an assembly of units consisting of hydraulic, accelerator, control, and transfer pump units mounted on a drive unit arranged for flange mounting on the engine. The proven dependability of Ex-Cell-O Pumps enables this equipment to provide trouble-free operation with a minimum of service attention. However, when servicing *is* required, the Ex-Cell-O design permits convenient, time-saving, low cost, *modern* servicing by simply replacing the one unit that requires attention. Specifically:

**Servicing can be done by any mechanic, with ordinary tools.**

**Only the particular unit requiring servicing need be sent to the depot for repairs.**

**The entire pump is out of service only a matter of minutes. Re-calibrating the pump in the field is not necessary, as each unit is properly calibrated before it leaves the factory.**

Ex-Cell-O Fuel Injection Equipment has been thoroughly proven in the severest kind of service, both military and commercial. For complete information concerning Ex-Cell-O Diesel Fuel Injection Equipment, Diesel engine builders should address Diesel Division, Ex-Cell-O Corporation, 1200 Oakman Boulevard, Detroit 6, Michigan.

XLO
EX-CELL-O *for* PRECISION

EX-CELL-O
DIESEL FUEL INJECTION
EQUIPMENT
EX-CELL-O CORPORATION · DETROIT


### Exchange Maintenance Ideas

. . . . *Continued from page 70* . . . .

internal part of the casting causing it to grow, pushes the outer casting open. In welding up cracks in outer castings of this type bronze often has advantages over other metals. High strength bronze being several times stronger than cast iron, considerable reinforcing can be done and less preheating is necessary.

In such cases it is well to vee the crack with either a grinder or chipping tool. The V should be shallow and wide, about half the thickness of the metal itself in depth, and the thickness of the metal to each side of the crack. This will permit bonding of the bronze at a very low temperature. After a layer of bronze is deposited, peening is often helpful in stress-relieving the weld, but do not expect too much from it. After welding and machine work are completed, castings should be tested by a hydrostatic test. Figures 3 and 4 show a finished job on the castings shown in Figures 1 and 2.

### Reps Gather at Curtiss Opening

SPENCER W. CURTISS, Inc., Industrial Advertising Agency of Indianapolis and Chicago, recently celebrated the opening of its San Francisco offices with a reception and cocktail party attended by a large group of Pacific Coast publishers and radio representatives.

*Curtiss Reception Double Celebration—left to right: Mrs. Spencer W. Curtiss, Mrs. D. J. Buttles and Miss Polly Surber, Executive Secretary to Mr. Spencer W. Curtiss, discuss the imminent arrival, on leave, of Captain D. J. Buttles, ATC, former Sales Manager of the Cummins Engine Company, Columbus, Ind., at a cocktail party and reception marking the opening of the San Francisco offices of Spencer W. Curtiss, Inc.*

The new office, headed by Spencer W. Curtiss, President, will continue the firm's established policy of specialization in the Industrial Field. In the opinion of President Curtiss, the Western market is certain to become of greater importance as the trend of war moves westward and the post-war period approaches. The new Curtiss offices are located at 1901-4 Mills Tower in San Francisco.

## Inspection and Maintenance of Shipboard Electrical Auxiliaries

*Continued from page 64, Diesel Progress, March*

*By* R. N. TOMB*

Under normal installation or operation, these parts do not need resetting. These control devices have been calibrated by the manufacturer, and should any adjustments be necessary, consult his maintenance manual or refer to his representative.

4. Check all arc chutes, resistors, shunt connectors, and moving parts for obvious mechanical faults. Be certain that moving parts move freely and are free from abrasives or binding. Long coil wire leads can drop between moving parts or contact surfaces and cause faulty operation. Be certain that these wires cannot interfere with devices mounted on the same panel.
5. Close each control device by hand, using the same motion as if it were operated electrically. Check the contact tips for proper wiping. Most contact surfaces touch each other before the device completely closes, thereby causing a wiping motion and helping to maintain a clean, smooth surface. This check will sometimes disclose that the tips are not making proper contact. Rheostat contact arms should also be inspected for freeness or for good electrical connections.
6. Test all fused circuits by means of a battery and lamp arrangement. Many a-c motor troubles result because of one line fuse being blown, thereby causing the motor to run single phase.
7. Always double-check d-c motor field control wires. A loose or broken wire in this circuit may cause the motor to run at injurious speeds or even to "run wild."
8. Be very cautious in oiling control device bearings. Excess oil may be deposited on spare connectors or contact makers and cause faulty operation.
9. Compare the nameplate stamping with the manufacturer's drawing or the elementary diagram. This diagram is the most valuable tool the manufacturer can supply for trouble shooting.
10. Before placing the control in actual operation, it is advisable to disconnect the motor in order to check the operation and sequence of the control devices.

No portion of any control equipment is so simple that it does not require regular and efficient inspection. These check-ups should be made at the end of each voyage, or at least once during each voyage if possible. Circuits which are in constant operation or which are extremely vital to the ship's operation should receive first consideration. Periodic inspection and cleaning of this equipment can be handled as follows.

1. Inspect contact tips to be certain that they are free from blisters, large beads, or that they are not badly fitted. (Fig. 7) If these are present, clean the tips with a fine file. If the parts are badly worn, replace them. When renewing contact tips, the contact surfaces between the tips and the shunts should be cleaned but the plating must not be removed from the shunt.
2. Inspect the surface of the contact tips for discoloration. This is a sign of overheating, and can be caused by insufficient contact material or improper contact spring pressure. If these contact springs have been overheated and are discolored or weak, replace them with a spring of same wire size and number of turns. To check the contact pressure, insert a piece of paper between the contact points and apply power to the device. By observing the amount of pull necessary to

* *Federal & Marine Divisions, General Electric Company.*


# DIESEL POWER
## ...the "lucky" industry

PERHAPS it was luck that war gave the Diesel industry a chance to prove itself.

But it was not luck that the industry was ready when, overnight, the staggering demands of war were thrust upon it.

It was not luck that Diesels rose to the occasion so brilliantly.

It is not luck that Diesels' great wartime job assures the industry a great peacetime future.

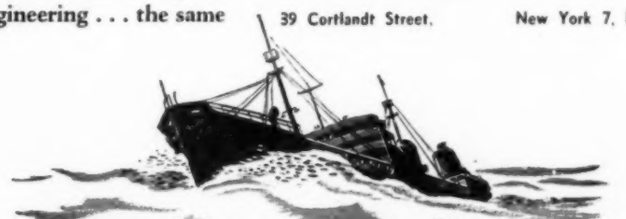
No, there was something more than good fortune involved. There was foresight, patience, and, most importantly, sound engineering . . . the same factors that have brought VORTEX Diesel products to peak efficiency.

Today our production of VORTEX Spark Arresters, Silencers, and Arrester-Silencers is enlisted for the duration. But come peace VORTEX will again be turning out, for marine and commercial use, these important engine auxiliaries which are now contributing so much to the safe, silent, low-cost operation of Diesels at war.

And when that day comes, look for the biggest boom in Diesel power the world has ever seen.

**ENGINEERING SPECIALTIES CO., INC.**

39 Cortlandt Street, New York 7, N. Y.



**VORTEX**

SPARK ARRESTERS ★ SILENCERS ★ SPARK ARRESTER-SILENCERS

remove the paper, one can tell if the proper pressure is being maintained.

3. Check mechanical interlocks by completely closing one contactor. Constant operation or vibration may have caused misalignment. The mechanical interlock is designed to keep the tips of one contactor from making contact when the tips of the other contactor are just touching.
4. Electrical interlock should be inspected occasionally to see that proper contact is made. The tips should work freely and when badly pitted should be cleaned with a fine file.
5. Should an overload device trip and shut down the motor, it is advisable to check the cause before restarting. If a check can be made quickly following the shutdown, inspect the units for overheated bearings, jammed machinery, or blown fuses. If one of the line fuses has blown, the motor may have been running single phase. A polyphase motor will run under this condition, but will not start after being shut down. If the motor fails to start, but makes a humming or a growling noise, one fuse is probably blown. In case the motor is connected to an a-c reduced-voltage starter panel, (Fig. 8) check the run contactor position. Cases are on record where the motor started properly, but when changed to the "run" connection, one line was found open and therefore caused the motor to run single phase. All of these conditions will cause the motor to overheat, draw excessive line currents, and usually will trip the overload device. It is also wise to compare the temperature of the motor with others operating in the same room.
6. If the overload relay is tripping on slight overloads, readjust the relay setting by moving the pointer approximately 5% higher. Never advance the cutout point more than 5% at any one time. If the design of the relay does not permit readjustment of the cutout setting, consult the manufacturers printed instructions or his representative and install an overload relay coil of the next higher rating.

Periodic checks of motor loads, operating voltages, line frequencies, or insulation resistance, will often disclose the possible failure point in the electrical system. Many successful operating engineers have adopted this scheme, and in some cases actually conduct load tests of each application. The results of these tests are then compared with the nameplate data or with the manufacturer's drawings, and serious overload conditions uncovered before trouble occurs. (Fig. 9)

Handy pocket-size or medium-size portable instruments are now available, which enable these power checks to be made conveniently. A set of the following instruments will be handy in making these surveys, and in most instances will give a clue to any existing electrical problems. All of these instruments can be obtained for a very small investment.

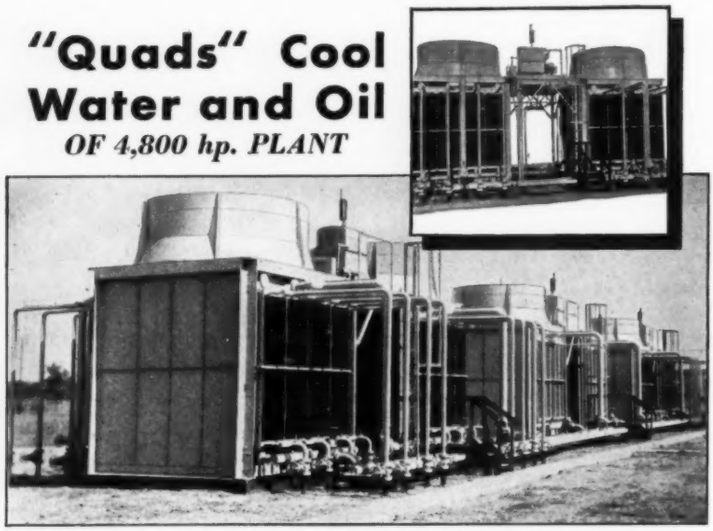
### AMMETERS

Convenient hook-on ammeters are available for a-c circuits without disconnecting lines or taking the equipment out of service. (Fig. 10) D-C ammeter readings can also be obtained at the control panel with a minimum of trouble. Some control circuits are designed with test jacks provided for this purpose. Load tests of each motor should be made at least once every year, or more frequently if the motor temperature has risen abnormally.

### VOLTMETERS

To obtain voltage readings easily and safely use two wooden or fibre poles with metallic tips connected to lead wires fastened to the poles with friction tape, and connected to a voltmeter (Fig


"Quads" Cool Water and Oil
OF 4,800 hp. PLANT

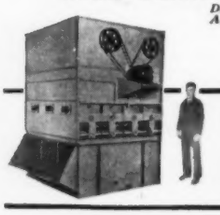


★ ★ The above battery of Young "Quad" Coolers maintains the jacket water and lubricating oil of eight 600 hp. v-angle compressors and driving engines at suitable operating temperatures. This installation at a Southern Illinois refinery* for the production of Iso-Butane and Butane has been in successful operation for more than a year. Four of the six units have oil cooling sections mounted in front of the jacket water cooling cores. Auxiliary engines (each serving two units) rotate 10 ft., especially designed, induced draft fans through right angle speed reducers. At present, cores are installed in only two sides of each "Quad", leaving room for increased cooling capacity to take care of future plant expansion. Write for complete engineering data.

YOUNG RADIATOR CO., Dept. 234D, RACINE, WISCONSIN, U. S. A.

*Distributors: The Happy Co., Tulsa, Oklahoma - A. R. Flournoy, Bell (Los Angeles), California - Wrightson-Campion, New York, N. Y. - W. P. Nevins Co., Chicago, Illinois - C. H. Bull, San Francisco, California. Export: Ameresco, Inc. New York, N. Y.*

*Three "Quad" Condensers are used to condense 40,000 lbs. of steam per hour at 10 lb. gauge pressure.



Young "Quad" Coolers and Condensers function on the same principle as automotive radiators—there are no water losses or external pumping heads. Where temperatures below the ambient dry bulb are required Young evaporative type units (left) may be used independently or supplementary to "Quads". Minimum operating costs and water make-up requirements are assured with these efficient evaporative coolers and condensers.

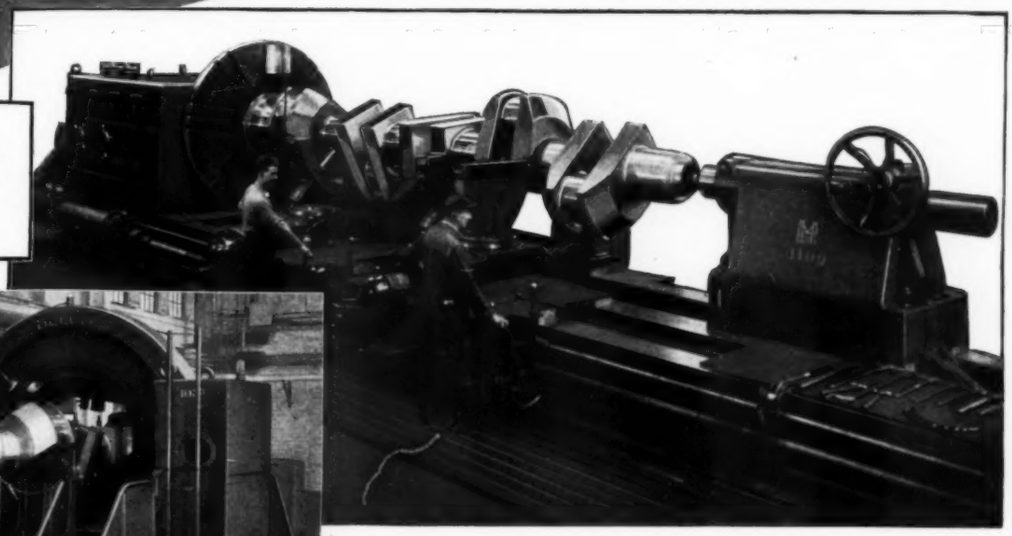
YOUNG

BUY BONDS PRODUCE MORE SALVAGE SCRAP WIN THE WAR

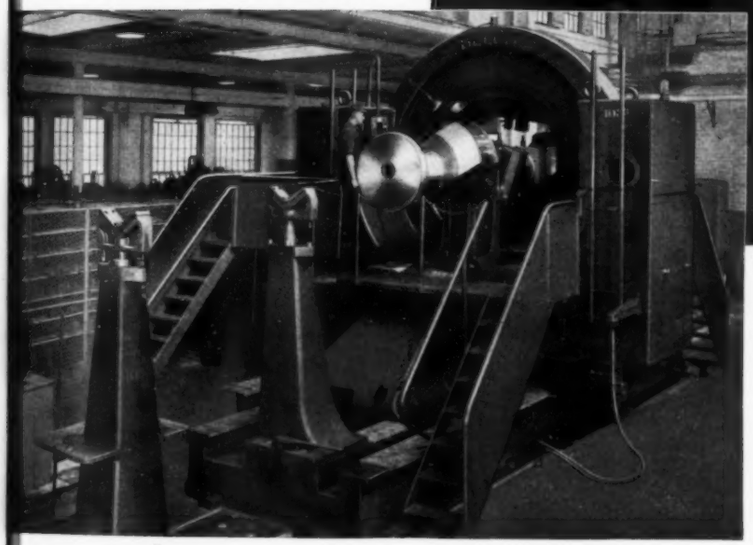
HEAT TRANSFER ENGINEERS

Manufacturers of Oil Coolers . Gas, Gasoline, Diesel Engine Cooling Radiators Intercoolers . Heat Exchangers . Engine Jacket Water Coolers . Unit Heaters Convectors . Condensers . Evaporators . Air Conditioning Units . Heating Coils Cooling Coils . and a Complete line of Aircraft Heat Transfer Equipment.

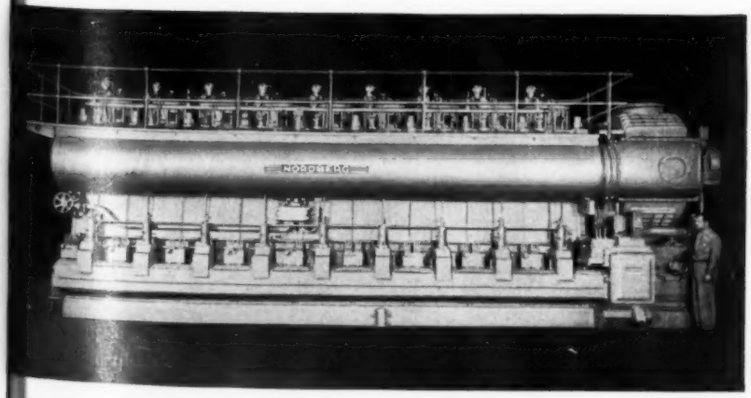
# Facilities for building NORDBERG DIESELS



The largest crankshafts can be turned on this 84 inch lathe.



This 72 inch lathe for turning crank pins is one of the largest in this country.



Many of these nine cylinder 3600 horsepower Nordberg Diesel engines are in stationary and marine service.

**These two lathes are typical of large and specially designed equipment installed by Nordberg for the building of Diesel engines. In addition to modern machine tool equipment and manufacturing facilities, there is that Nordberg experience — that "know-how"— which has been acquired through many years of building Diesel engines and other types of high grade power machinery. Plant facilities, trained personnel and experience now serving to produce Diesel engines for wartime needs will in the postwar period again provide the dependable and economical Nordberg Diesels required for peacetime needs.**

**NORDBERG MFG. CO.**
**MILWAUKEE 7 • WISCONSIN**

NORDBERG MACHINERY

**NORDBERG**
**DIESEL ENGINES**

NORDBERG MACHINERY

11.) Test leads so arranged can be inserted into conduit boxes, across contactor coils, or other spots which might otherwise be inaccessible or dangerous to reach. Most control circuits are designed to operate properly if the line voltage is within 80 to 110 per cent of the equipment's nameplate rating. If an overvoltage condition exists, the deterioration of insulation is more rapid, and each device will suffer from overpounding in operation. An undervoltage condition will cause improper seating of contacts. This may result in creating an arc which would weld shut the contact points and cause faulty operation.

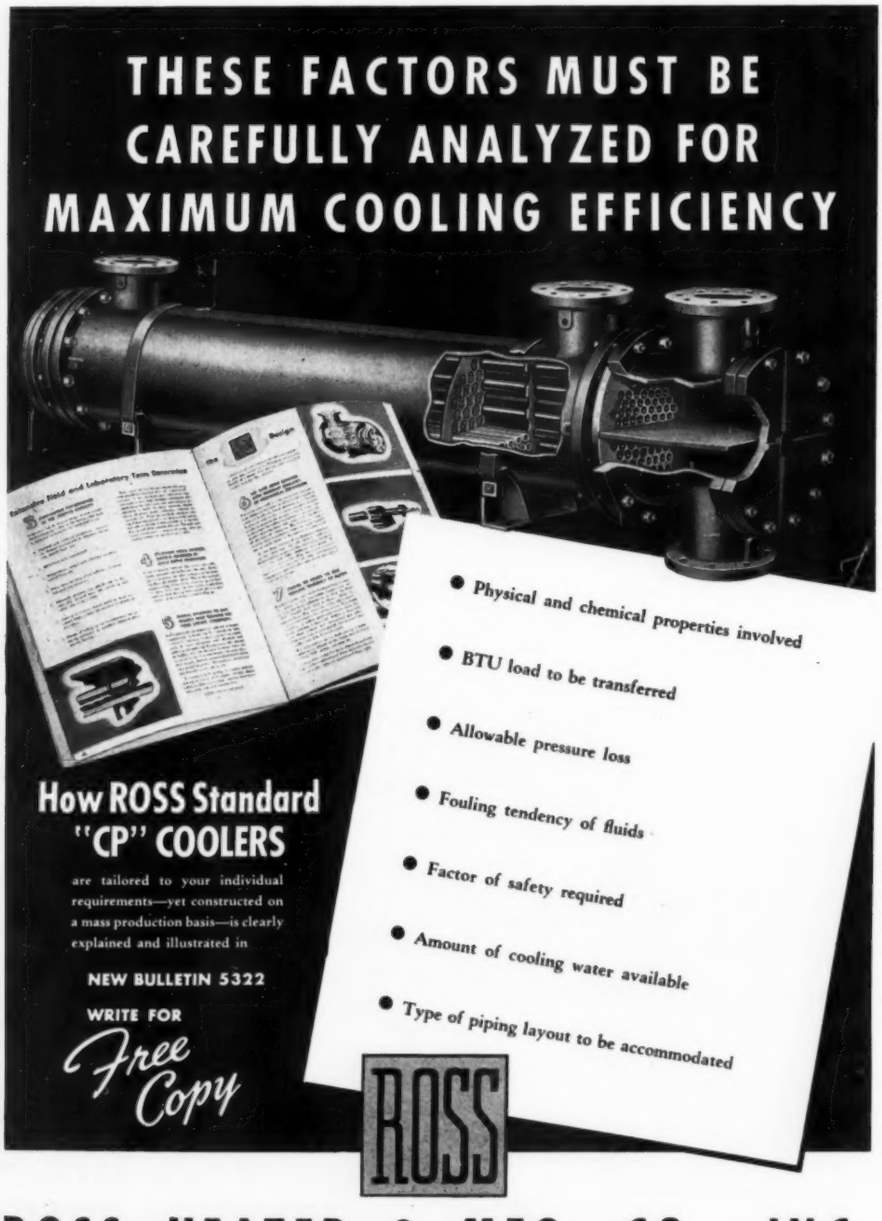
FREQUENCY METERS

Dips in line frequency will cause the same trouble as variations in line voltage. The special leads suggested for the voltmeter above will prove very beneficial in obtaining frequency readings and helping to locate failure points.

MEGOHM METERS

This instrument is used to determine the quality of all insulation in the electrical circuit. The meter consists essentially of a direct reading, permanent-magnet, moving coil ohmmeter, mounted in a carrying case with a hand-driven d-c generator. The pointer is deflected across the scale as in the voltmeter to indicate directly in ohms the insulation resistance of the circuit being checked. Without good megohm results, the electrical system is considered unsafe. Some operating engineers state that the minimum megohm reading should be equal to the rated voltage of the circuit or machine divided by 1000. Note, however, that one megohm reading does not divulge accurate information. Tests should be made until consistent high readings are obtained, or until the manufacturer's original readings are approximated.

Each of the points listed in the preceding tabulations can be expanded into many varying details. As new situations arise, or as experience is gained, different ideas will be added, and the maintenance problem further advanced as an exacting science. Test records, if religiously maintained, will also add new stories and help solve future problems. Through all this, remember that the secret of successful electrical auxiliary operation lies in inspection routines.



THESE FACTORS MUST BE CAREFULLY ANALYZED FOR MAXIMUM COOLING EFFICIENCY
How ROSS Standard "CP" COOLERS
are tailored to your individual requirements—yet constructed on a mass production basis—is clearly explained and illustrated in
NEW BULLETIN 5322
WRITE FOR
Free Copy
Physical and chemical properties involved
BTU load to be transferred
Allowable pressure loss
Fouling tendency of fluids
Factor of safety required
Amount of cooling water available
Type of piping layout to be accommodated
ROSS
ROSS HEATER & MFG. CO., INC.
Division of American Radiator & Standard Sanitary corporation
GENERAL OFFICES AND PLANT 1425 WEST AVE., BUFFALO 13, N.Y.


## Army-Navy "E" To Air-Maze

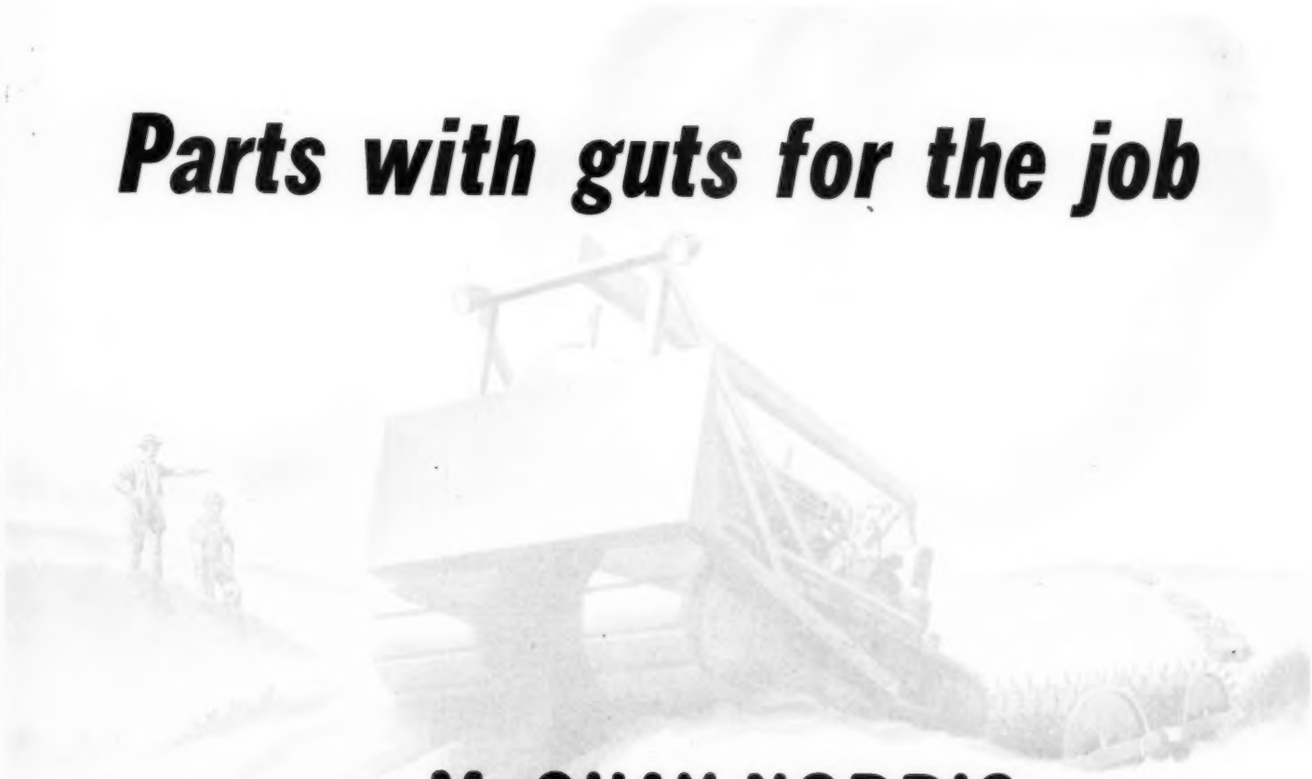
THE Army-Navy "E" has been awarded Air-Maze Corp., Cleveland, Ohio, designers and builders of air filters and allied products for the armed services and essential industries.

Filters, oil separators and special devices manufactured by Air-Maze are in use on all the fighting fronts, in aircraft, ships, motor vehicles of all kinds, also other types of equipment.

*Extreme left: Major R. H. Humphrey, district public relations officer, presents Army-Navy "E" award to A. E. Schaaf, President, extreme right.*

On the production front, Air-Maze filters are widely used in air conditioning of plants, in engines and compressors, in the photographic and electrical fields, and many others. Officers of the company are A. E. Schaaf, president; O. H. Schaaf, vice president; G. M. Walton, vice president; H. H. Schaaf, treasurer; and L. M. Henton, secretary.

# Parts with guts for the job



## McQUAY-NORRIS
### ALTINIZED
## PISTON RINGS

**In trucks, tractors, locomotives, ships . . . wherever there is work for Diesels, McQuay-Norris parts are giving efficient, dependable, economical performance. With 34 years' experience in precision manufacture, McQuay-Norris includes the Diesel field in its achievements in metallurgical development, heat treating, clinical research and engineering design. Send us your blueprints.**

ARMY E NAVY

*Awarded to two plants McQuay-Norris Ord. Management Division*

# McQUAY-NORRIS
MANUFACTURING COMPANY

TIME TESTED McQUAY NORRIS AUTO PARTS PROVEN IN SERVICE

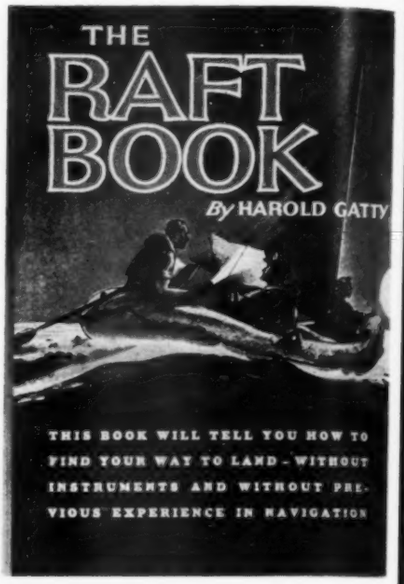
ST. LOUIS, MO.

PRECISION WORKERS IN IRON, STEEL, ALUMINUM, BRONZE, MAGNESIUM

## Atlas Diesel Offers Civilian Edition of Gatty's "Raft Book"

YOU may never be lost at sea—and again you may, but, in either case, you will be absorbed in Gatty's Raft Book from the minute you start reading it. Anyone interested in natural phenomenon will find this book a pleasant and helpful companion whether on land or sea.

A graduate of the Royal Australian Naval College and for years a navigator in the Australian Merchant Marine, Gatty explains in clear, simple, non-technical language how those lost at sea can most quickly make their way to land by the observation of natural phenomenon. Based primarily upon research into the methods used by the Polynesians, who sailed unerringly over thousands of miles of the South Pacific in colonizing expeditions, Gatty's book is primarily a compilation and description of trade winds, currents, cloud types, wave forms, stars, sea birds, fishes, and other bits of nature, together with the key to determining position at any time from the careful observation of such natural phenomenon.


THE
RAFT
BOOK
By HAROLD GATTY
THIS BOOK WILL TELL YOU HOW TO FIND YOUR WAY TO LAND - WITHOUT INSTRUMENTS AND WITHOUT PREVIOUS EXPERIENCE IN NAVIGATION

Believing that the information contained therein would be of great interest to yachtsmen and fishermen, the Atlas Imperial Diesel Engine Company has made arrangements for the printing of a civilian edition of Gatty's "Raft Book." Price $3.25. Order from Atlas Imperial Diesel Engine Co., 228 No. La Salle St., Chicago, Illinois or from the Atlas office in your city.

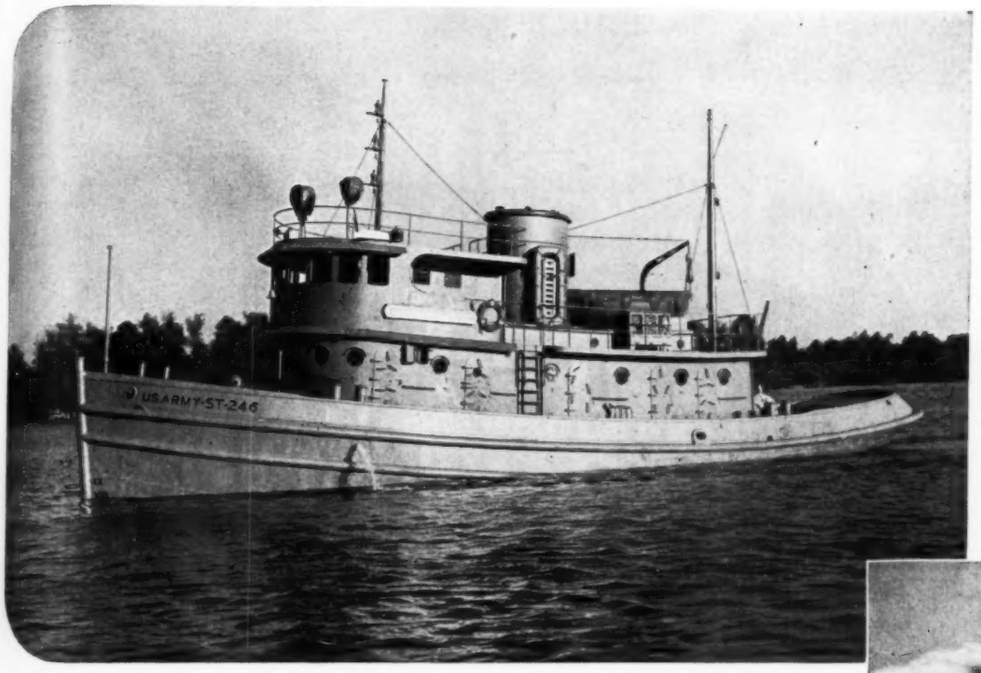
Take a Second Look at a DELUXE CARTRIDGE
ESSENTIAL TO OIL CLEANSING IS THE DELUXE Backbone
In every DeLuxe Cartridge is a backbone . . . a carefully engineered spring that keeps the cartridge from compressing as oil is fed through it. Thus, the density of the DeLuxe cartridge is always maintained to permit the flow of oil through the cartridge at the prescribed rate necessary to the actual cleansing of the oil.
Only the DeLuxe cartridge has this collapse-preventing backbone. It is one of the exclusive DeLuxe cartridge features which makes the use of the DeLuxe Cartridge essential to the proper functioning of the DeLuxe Oil Filter.
Send for Free Booklet today. Write DeLuxe Products Corp., 1416 Lake St., La Porte, Indiana.
GENUINE DELUXE CARTRIDGES ARE AVAILABLE— ACCEPT NO SUBSTITUTES
NO CARTRIDGE COLLAPSE SPRING AND CONE ARE AN INTEGRAL PART OF EVERY CARTRIDGE
DELUXE Oil Filter
DOES MORE THAN STRAIN OIL . . . MORE THAN FILTER OIL
ACTUALLY CLEANSES OIL


## Blackmer Pump Has New Minneapolis Representative

FORD BROWN, assistant manager of the Blackmer Milwaukee office, has been transferred to Minneapolis, as of January 1, 1944, and now is in charge of pump and accessory sales in Minnesota, North and South Dakota and Northern Wisconsin.

Prior to his assignment to the Milwaukee office, Mr. Brown worked for some time at the Blackmer home office plant in engineering, assembly, testing and sales departments. This, together with his broad experience in petroleum and the general industrial field, provides a background which should make him welcome among users of rotary pumps.

In making this announcement, Mr. J. B. Troeman, General Sales Manager of the Blackmer Pump Company, states that the advancement of Mr. Brown was due quite as much to his exceptional energy and interest in customer's pumping problems, as to his technical knowledge and ability. The change in the Minneapolis office was brought about by the death of Mr. S. P. McElmeel, last November.




Busch-Sulzer Diesels are being installed in Army towboats, of the type pictured (left), used in securing beachheads. The all-steel lighter (below), launched by a St. Louis shipbuilding concern, will be filled with supplies from transports in the war zones and towed ashore.

# She Has Something Else In Tow ...SKILL FOR THE FUTURE

To build engines for towing craft like that pictured here ... and other engines for the Navy ... and naval ammunition hoists with watch-like precision mechanism ... we greatly expanded our facilities and increased our trained personnel by 50 percent within the last 18 months.

May we suggest that you begin now to familiarize yourself with your postwar requirements and acquaint us with them in good time?

For the last three years, our total output naturally was devoted to orders for the Navy, Army, Maritime Commission and projects connected with the war effort. While the need exists, such work will have first call on our full capacity, but when this demand slackens our facilities and our personnel can be devoted immediately to your requirements. Obsolescence and the need for power in new enterprises plus the fact that many Diesel manufactories in other countries have been damaged or destroyed will result in a huge demand for engines. Your inquiry at this time will enable us to plan so that there need be no delay in filling your needs as soon as capacity is available.

**BUSCH-SULZER BROS.—DIESEL ENGINE COMPANY**
**SAINT LOUIS**

AMERICA'S OLDEST BUILDER OF DIESEL ENGINES

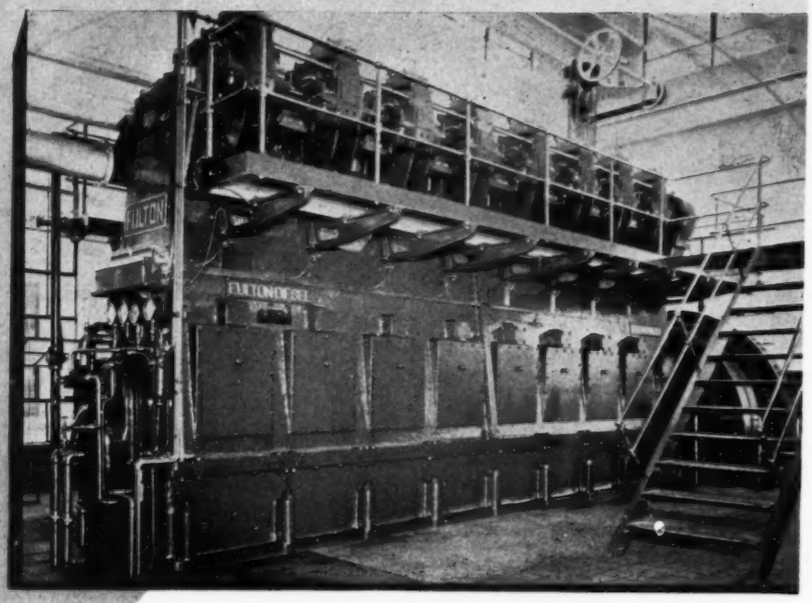
BUSCH-SULZER ST. LOUIS

## U. S. Navy Will Commission A Number of Specialist Officers

THE Office of Naval Officer Procurement has announced it will receive applications for qualification of a number of specialist officers to be assigned duty in connection with the servicing, maintenance and repair of internal combustion engines in operating vessels in advanced areas. Applicants must have a degree from an accredited college and have, at least, five years of experience in the field of machinery manufacture, installation or service. In the absence of a degree, applicants must have, at least, ten years experience in responsible charge of work in machinery manufacture, installation or service. In either case, experience must be with steam turbines, internal combustion engines, reciprocating steam engines, or electrical machinery, both AC and DC. Age limits are 24 to 50; rank will be comparable with age. Indoctrination courses will be given and special training in logistics at Mechanicsburg, Pennsylvania. Application should be made at the Office of Naval Officer Procurement, 33 Pine Street, New York 5, N. Y. or other procurement offices in principal cities throughout the United States.


SUCCESSFUL ENGINE BUILDERS

1852 FOR 92 YEARS 1944



Ninety-two years is a long time — yes, not far from a century of Engine Building Experience — to back up the Fulton Diesels we shall build for the peace-time World. In better than nine decades we have learned how to design and build Diesels for long, carefree, dependable and profitable service — with nothing left to guess work. These characteristic qualities of Fulton Diesels have been demonstrated in practically every type of stationary application — continuously for many years.

625 H.P. to 2000 H.P.

FULTON IRON WORKS CO.

• ST. LOUIS • MISSOURI •

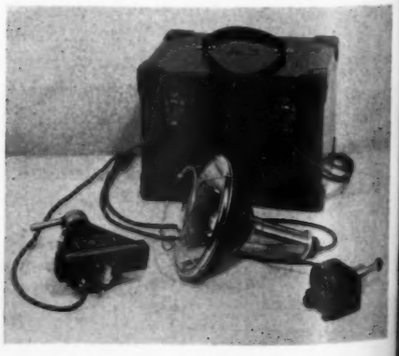

## Electric Machinery Elects W. H. Feldmann

W. H. FELDMANN, vice president and general manager since 1940, has been elected president and general manager of Electric Machinery Mfg. Company. Mr. Silas McClure, president since 1921, was elected to the chairmanship of the board of directors, according to a recent announcement.

*W. H. Feldmann*

Mr. Feldmann has been associated with Electric Machinery for 22 years, having been in charge of district sales at Cleveland and Chicago before his appointment as general sales manager in 1927. In 1936, he was elected a director of the company, and in 1937 made vice president in charge of sales.

## Remote Control Added to Portable Balancing Equipment



*Portable balancing equipment with Vibrometer, Stroboscope and Remote Control.*

THE Davey Portable Balancing Equipment for

# Marquette

## HYDRAULIC GOVERNORS and OVER-SPEED TRIPS

precision made for

trouble-free operation

BUY MORE WAR BONDS

ARMY NAVY E FOR EXCELLENCE

## The Marquette METAL PRODUCTS CO.

CLEVELAND 10, OHIO

*Manufacturers of:* HYDRAULIC AND ELECTRIC WINDSHIELD WIPERS FOR AIRCRAFT
HYDRAULIC GOVERNORS FOR DIESEL ENGINES • ROLLER BEARING TEXTILE SPINDLES • FUEL OIL PUMPS
AIR COMPRESSORS • PRECISION PARTS AND ASSEMBLIES

dynamic balancing of machine parts of all sizes in their own bearings or in bearings built for the purpose, is now supplied with an added feature. The equipment consists of a Vibrometer which measures vibration amplitude directly and a Stroboscope which gives a direct visual reading of "High Spot" or Phase Angle. The new feature is a remote control switch mounted on the Vibrometer which places the entire operation in the hands of a single operator, instead of adjustments being made by a second operator, as in earlier models. Simplicity of construction and operation have been retained so that balancing may be performed by practical men and theoretical knowledge is not required to interpret the results. Two models are available weighing, respectively, 22 and 25 lbs. complete in portable case with batteries. The Vibroscope Co., 6 E. 39th St., New York 16, N. Y.

## Moore Named Manager of Worthington Marine Engine Sales

WORTHINGTON Pump and Machinery Corporation announces the appointment of Wesley B. Moore as Manager of Marine Engine Sales with offices at Worthington's Buffalo, N. Y., plant. Identified with Diesel engine industry some twenty-two years following graduation in mechanical engineering from Steven's Institute of Technology, Mr. Moore, prior to service with Worthington, was long associated with Fairbanks-Morse in various capacities including Manager of Fairbanks Morse's Marine Department in New York City and, more recently, Manager of General Diesel Sales at its Chicago office.

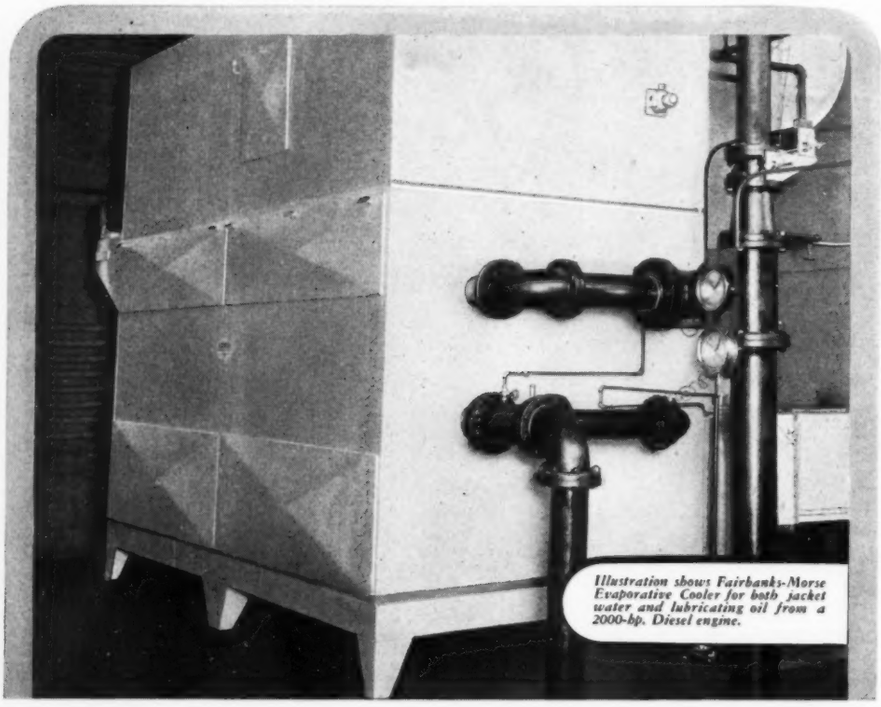


*Illustration shows Fairbanks-Morse Evaporative Cooler for both jacket water and lubricating oil from a 2000-hp. Diesel engine.*

*Wesley B. Moore, Manager of Marine Engine Sales, Worthington Pump and Machinery Corporation.*

Mr. Moore's present assignment follows Worthington's interest in increased marine application of its regular Diesel engine line and a contemplated line of newly designed marine Diesels.


**PLAY SAFE!**

**Improve Your Engine Cooling System with a FAIRBANKS-MORSE Evaporative Cooler**

Don't take unnecessary chances on costly shutdowns!

Investigate—then install—Fairbanks-Morse Evaporative Coolers on your Diesel and gas engines. They assure you of longer engine life, fewer shutdowns, less repairs—more economical over-all performance and protection.

Fairbanks-Morse Evaporative Coolers save water—using actually only 5% of the amount generally required for a continuous water supply.

Write for complete information to Fairbanks-Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

BUY WAR BONDS

**FAIRBANKS-MORSE**

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
WATER SYSTEMS
SCALES
STOKERS
FARM EQUIPMENT
RAILROAD EQUIPMENT

Diesel Engine Cooling Equipment


## 1943 Editorial Index Now Available

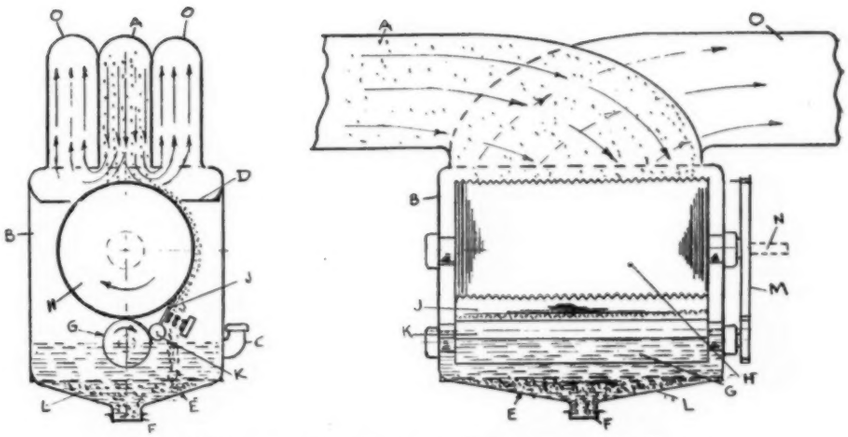
A COMPLETE index of all articles and editorial material with a cross index of authors which appeared in the 1943 issues of DIESEL PROGRESS is now available. Copies of this ten-page index will be mailed upon request without charge. Write direct to DIESEL PROGRESS, 2 West 45th Street, New York 19, N. Y. for your copy.

## Benjamin Franklin Says—

"THE eyes of Christendom are upon us, and our honor as a people is become a matter of utmost consequence to be taken care of. If we give up our rights in this contest, a century to come will not restore us to the opinion of the world. . . . Present inconveniences are, therefore, to be borne with fortitude, and better times expected."

## New Rotary Air Cleaner Announced

AN interesting new type of rotary air cleaner has been developed by the American Armament Corporation of New York. The principle of this new air cleaner exploits the difference of inertia between the air and dust particles in the high velocity air stream of an engine intake. Referring to the diagram it is seen that the dust-laden air entering through the intake "A" changes direction 180° immediately it enters the housing "B" and thence exhausts through the outlet "O". Because of the greater inertia of the dust particles, they continue to travel in a straight line and impinge on the surface of the rotating drum "H". The drum is driven at about 30 rpm. through the medium of the drive "N" which may be actuated by any convenient means; very little power is required. A number of circumferential grooves extend across the entire length of the drum. A film of oil is deposited on the drum by an oil feeding roll "G", the lower portion of which is immersed in a bath of oil. Means are provided for controlling the thickness of the oil film on the drum. It is this oil film to which the dust particles adhere upon impingement. A spring loaded scraper "J" removes the oil film containing the dust, the latter settling to the bottom of the reservoir "E" from which it is removed periodically by draining at the plug "F". The AAC air cleaner is said not to offer increasing resistance to the flow air regardless of the amount of dust contained in the working oil. It is claimed that a typical AAC air cleaner suitable for a 1000 hp. internal combustion engine would fit into a space about 14 in. by 15 in. by 18 in. and would deliver approximately 1600 cu. ft. of air per minute with a resistance approximately equivalent to 3 in. of water. A series of tests are being made to determine the efficiency of this air cleaner.




*Schematic diagram of the American Armament Rotary Air Cleaner.*


WE WANT YOU TO KNOW

**To this end we have prepared a completely informative bulletin embodying a general description with tabulation of outstanding features, specifications and performance curves on the Model "80" line of Buckeye Diesel engines. Each component part of the engine is illustrated and described; fuel, lube and cooling systems are traced on three-color sectional charts.**

*Write on your letterhead for your free copy of The Model "80" Buckeye Diesel Bulletin.*

Be Profitwise and Dieselize with Buckeyes

THE BUCKEYE MACHINE COMPANY ..... LIMA, OHIO

### Twin Disc Offers New Bulletin On Hydraulic Torque Converters

FACTS concerning the function, operation and installation of "Hydraulic Torque Converters" are concisely presented in a 16-page booklet so entitled and just published by the Twin Disc Clutch Co.

This material will help machine designers, manufacturers and users to gain a clearer understanding of the capabilities of this modern method of gaining mechanical advantage between driving and driven units. A discussion of the Hydraulic Torque Converter's purpose is followed by a clear, simple explanation of how the device operates. Great care has been exercised to point out the various factors which should be considered when the use of these power links is contemplated.

Several models of the Twin Disc Hydraulic Torque Converter are described in detail with the aid of photographs and drawings. Sufficient installation data is included to make this booklet a valuable aid in the planning of initial layouts and in drawing up preliminary specifications for equipment on which torque converters are to be used.

As a contribution to the limited supply of published literature on the subject, "Hydraulic Torque Converters" is a booklet worth having. Designed as Bulletin No. 135, the booklet may be had on request to the Twin Disc Clutch Company, Hydraulic Division, Rockford, Illinois.


TO BE SURE OF MAXIMUM OIL CLEANING PERFORMANCE

*Replace All MICHIANA Elements with MICHIANA Elements*

● When servicing your filters, you can be sure of best performance with MICHIANA designed and made Elements. Every bit of engine power is vital today, and every precaution should be taken to insure longer engine life and less waste of manpower.

MICHIANA Oil Filters will help you reduce needless shutdowns, repairs, and premature parts replacements. Protecting millions of horsepower of engines all over the world, they are daily proving their high dirt-absorbing and oil-cleaning efficiency. To insure this performance, be sure when servicing that MICHIANA Elements are used. MICHIANA PRODUCTS CORPORATION, Michigan City, Indiana.

Made in capacities from 163 h. p. to 3266 h. p. All elements alike covering this wide range.

Michiana Oil Filters made to new Navy standards from 100 to 2000 h. p. with identical elements.

ARMY E NAVY

MICHIANA OIL FILTERS


### 1943 Editorial Index Now Available

A COMPLETE index of all articles and editorial material with a cross index of authors which appeared in the 1943 issues of DIESEL PROGRESS is now available. Copies of this ten-page index will be mailed upon request without charge. Write direct to DIESEL PROGRESS, 2 West 45th Street, New York 19, N. Y. for your copy.

### "Piston Packin' Mommas"

WOMEN in men's jobs are common enough right now, but these girls are believed to be unique—among the few female Diesel mechanics in the country. They work as a team, and are shown here putting the finishing touches on a Diesel engine installed in a 10-ton army prime mover at the Mack truck factory. The other mechanics, all male, have voted them their "Piston Packin' Mommas." Left is Amelia Balacich with Evelyn Beers on the right.

### 1943 Bound Volumes For Sale

A LIMITED number of bound volumes of the complete 1943 issues of DIESEL PROGRESS are available at $15 each postpaid. The demand for this volume of important issues will far exceed the supply; first come—first served. Write or phone your order direct to DIESEL PROGRESS. A complete index of articles and authors appearing in the 1943 issues of DIESEL PROGRESS will be included with each volume.

# TYPICAL DIESEL LUBRICATION PROBLEMS:

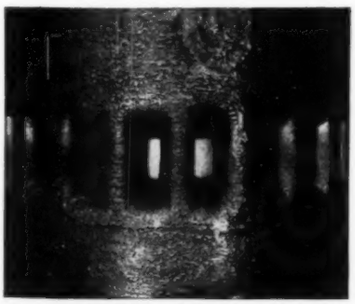
## 1. Port Clogging

The plugging of intake and exhaust ports is frequently a factor in the operation of two-cycle Diesel engines.

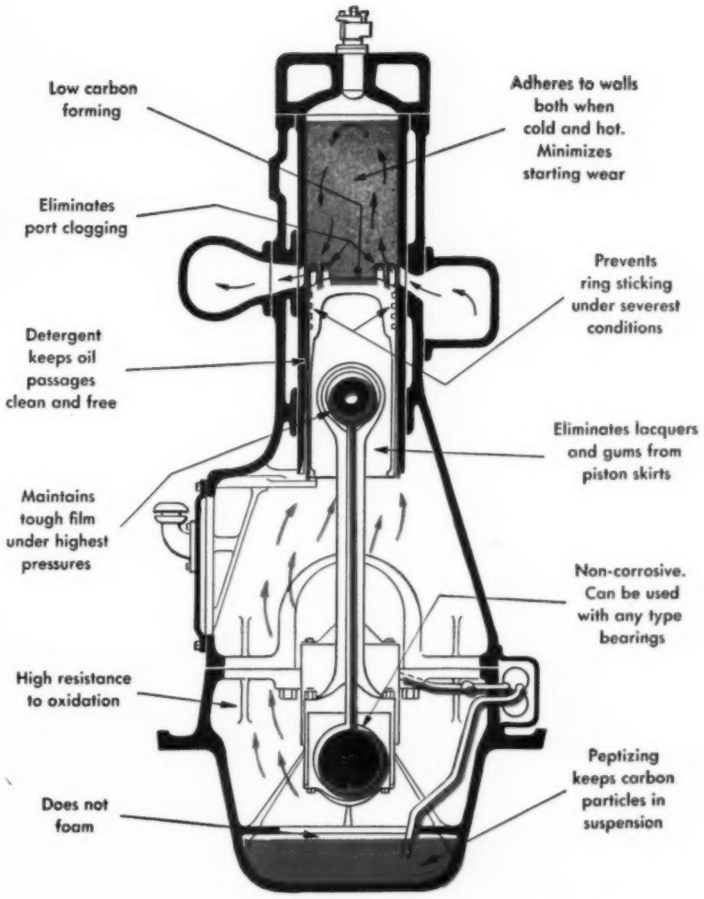
Port clogging results from the combination of fuel soot with the residues of oxidized lubricating oil, which acts as a binder to plug the port openings. This clogging, of course, results in a sharp drop in efficiency.

In simplified form, the deterioration of lubricating oil in an engine involves a combination of oxygen and oil at high temperatures. As the oil continues to absorb more and more oxygen, acids called "oxyacids" are produced. These oxyacids tend to polymerize or form very large, oil insoluble molecules. These form the binder for the deposits on intake and exhaust ports.

The problem, then, of eliminating these deposits may be solved by the use of a lubricating oil properly compounded to prevent it becoming a binder. RPM DELO accomplishes this in four separate ways.



**Unretouched photo** shows air ports from 1000 h.p., 12-cyl., 2-cycle Diesel streamliner locomotive after being lubricated with RPM DELO for 127,590 miles. This is typical of absence of port clogging experienced when RPM DELO is used.


Low carbon forming
Adheres to walls both when cold and hot. Minimizes starting wear
Eliminates port clogging
Prevents ring sticking under severest conditions
Detergent keeps oil passages clean and free
Eliminates lacquers and gums from piston skirts
Maintains tough film under highest pressures
Non-corrosive. Can be used with any type bearings
High resistance to oxidation
Peptizing keeps carbon particles in suspension
Does not foam

**Diagrammatic sketch** of 2-cycle Diesel, showing the typical location of intake and exhaust ports and the advantages obtained from the use of RPM DELO.

1. RPM DELO is manufactured from a carefully selected base oil containing natural inhibitors highly resistant to oxygen. It contains no heavy residues which may be left behind to act as a binder for the fuel soot.

2. RPM DELO contains a powerful oxidation inhibitor, which greatly reduces the rate at which the oil absorbs oxygen.

3. RPM DELO has chemical detergent properties. The compounding material reacts with the oxyacids to render them essentially inert so that they are no longer able to polymerize to form gums and lacquers.

4. RPM DELO has peptizing properties which enable it to maintain soot and oxidation products in suspension in minute particles. This prevents these materials from settling from the oil and forming engine deposits.

The elimination of port clogging, is, of course, only one of the valuable properties of RPM DELO. It also minimizes ring and cylinder wear, eliminates ring sticking, prevents excessive deposits on rings and will not corrode bearings.

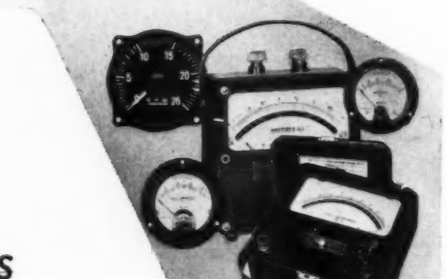
RPM DELO has world-wide distribution and is marketed under the following names: RPM DELO, Caltex RPM DELO, Kyso RPM DELO, Signal RPM DELO, Sohio RPM DELO, and Imperial-RPM DELO (concentrate).

RPM DELO

**STANDARD OF CALIFORNIA**

# A Third CITATION

**FOR THE INSTRUMENT LEADER**



*FOR MERITORIOUS WAR PRODUCTION*

This third citation for meritorious war production . . . climaxing a long record of war service . . . is a source of justifiable pride to the men and women of WESTON.

The record began back in the earliest days of our defense period, when a large segment of WESTON'S capacity was assigned to the production of instruments vital to military needs. Thus, when we finally were forced into this world struggle, WESTON was ready for *full-scale war production.*

This new star which adorns our "E" pennant marks the *third* time WESTON has been *first* in this highly specialized field to receive each successive war citation. Weston Electrical Instrument Corporation, Newark 5, New Jersey.

**WESTON** *Instruments*


## Gray Marine Diesels for Landing Boats Totalled over 4½ Million H.P. in 1943

THE Gray Marine Motor Company is permitted to announce that its production of Gray Marine Diesels for the U. S. Navy during 1943 totalled over 20,000 units, and it is continuing to supply these engines at an even higher rate in 1944.

*The 20,000th Gray Marine Diesel coming off the assembly line, December 27, 1943.*

The unit which Gray supplies to the Navy is the 6 cylinder high output Gray Marine Diesel, rated 225 hp. at 2100 rpm. This is the "71 series" General Motors 2-cycle Diesel Engine, adapted and equipped for marine propulsion by Gray.

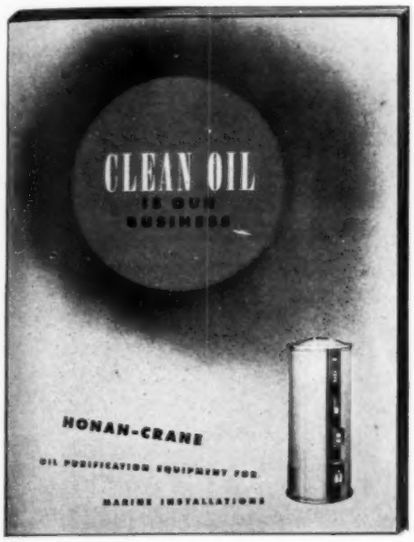
The engines are installed in various combinations in the 36-foot LCVP Landing Boat, the 50-foot LCM Tank Lighter, and the 105-foot LCT. Gray's first contract was awarded in the fall of 1941, and in January of 1943 secretary of the Navy Frank Knox announced that 25,000 Landing Barges had been completed, and that 55,000 craft of this type are on schedule.

The magnitude of these operations is illustrated by the fact that fifty-five thousand of these barges represent an aggregate of about 27,500,000 shaft horsepower, and that at top load they would require about 40,000 barrels of fuel per hour of operation.

These boats constitute a highly specialized part of the Invasion Navy which carried troops and equipment up on the beaches in operations such as those in North Africa and at Guadalcanal in 1942; at Attu, Kiska, New Georgia, Rendovo, Sicily and Salerno in 1943; at Tarawa and Kwajalein Atoll in 1944. The success of these boats in carrying out the most difficult of all military operations has marked one of the major developments of World War II. These same boats are also used by the Navy as lifeboats on transports, where the long cruising range of Diesels is a factor, and for lighterage work in harbors all over the world.

## Honan-Crane Issues New Marine Bulletin

HONAN-CRANE Oil Purification Equipment for Marine Installations is the title of a new 6-page bulletin just published by the Honan-Crane Corporation. This bulletin discusses the



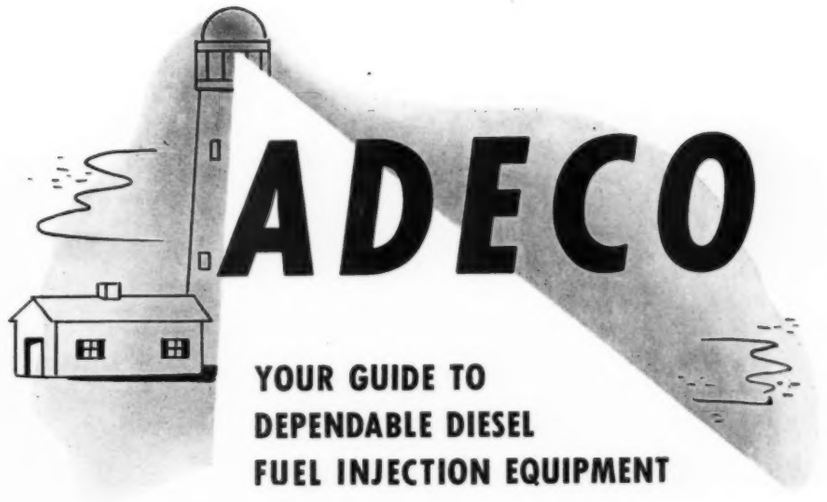

general problem of purification of lubricating oils for both Diesel and Turbine power plants, including such interesting subjects as Detergent Oils, Color of Turbine Oils and water in Turbine Oil. The bulletin points out the many features of Honan-Crane oil Purification Equipment for Marine installations. Write for Marine Bulletin . . . Honan-Crane Corporation, 202 Indianapolis Avenue, Lebanon, Indiana.

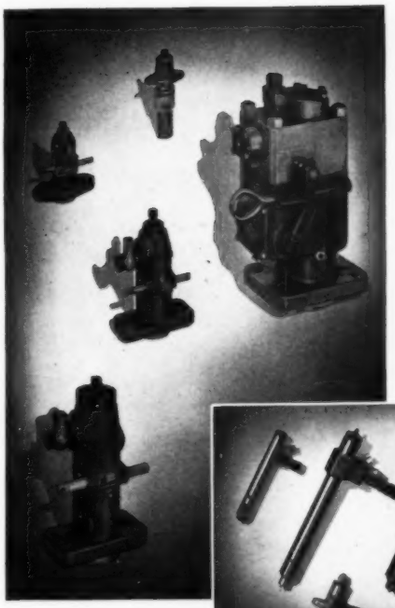
## Second Gold Star Award for Cooper-Bessemer

INFORMATION recently released by The Cooper-Bessemer Corporation, covering output of engine horsepower by its plants shows that outstanding monthly production records made throughout 1943 were maintained during the closing months of the year.

Appreciation of the company's achievements during the past six months was exemplified in a letter just received by Gordon Lefebvre, Cooper-Bessemer president and general manager, from Rear Admiral Howard L. Vickery, Vice-Chairman, U. S. Maritime Commission, which said in part: "In recognition of your continued achievement in completing wartime schedules in the manufacture and delivery of merchant ship components, the Maritime Commission Board of Production Awards has awarded your company its Second Gold Star to be added to your Maritime 'M' Pennant . . ."

In commending the company's workers for

**Today, more than ever, it will pay you to look to Adeco as your guide to dependable fuel injection equipment. Every Adeco fuel injection pump, nozzle and nozzle holder reflects the long experience in precision design and workmanship gained through years of pioneering and research for the diesel industry.**

**There's a wide range of standard equipment to meet your most exacting needs.**

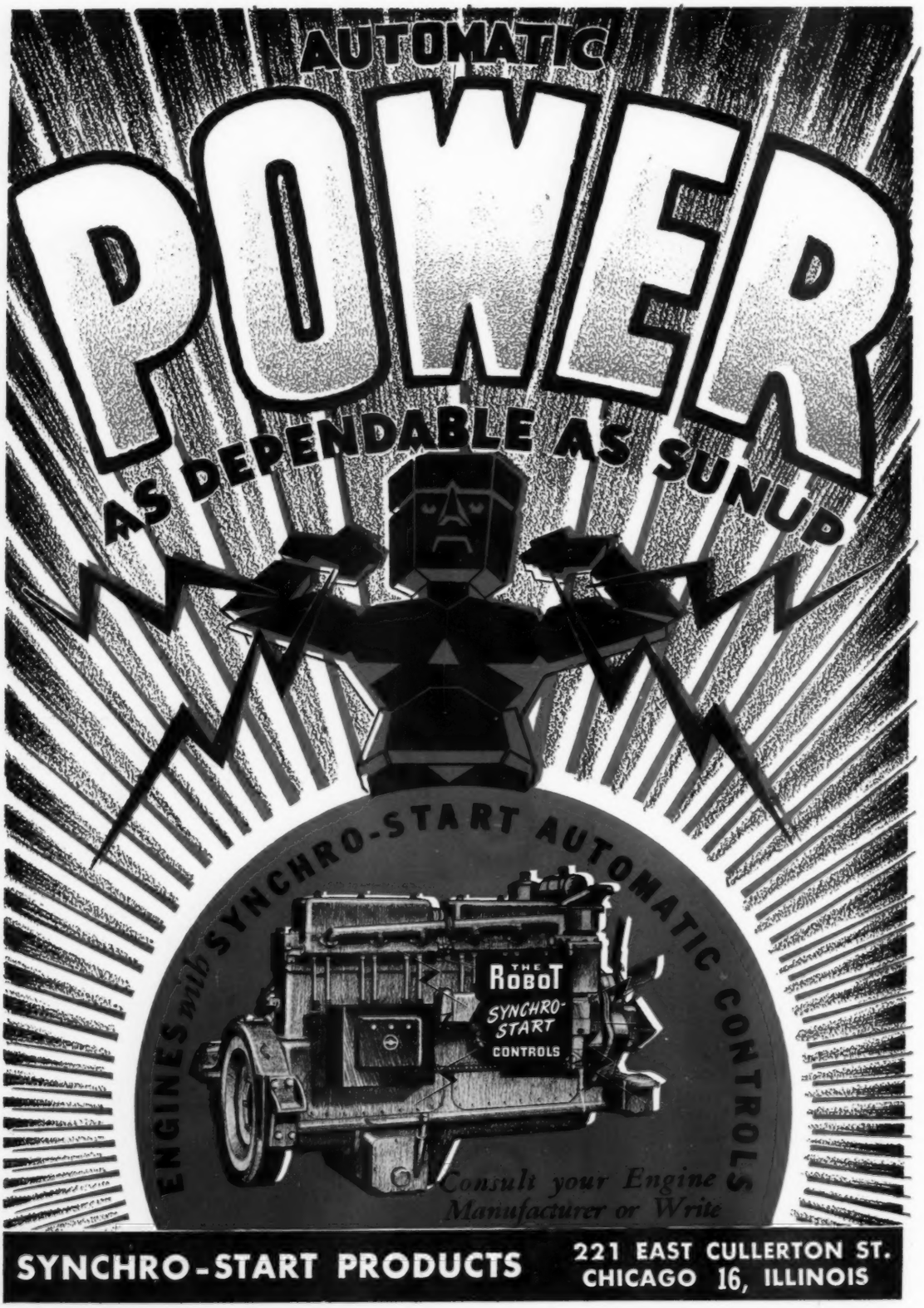
ADECO NOZZLE TESTER FOR LOW-COST MAINTENANCE

America's most widely used Nozzle Tester enables any mechanic to make quick, accurate tests on injector opening pressure, spray pattern, etc., and detect stuck needle valves and leakage around valve seats. Compact, portable, sturdy, precision-built. Pressure up to 10,000 p.s.i. Tests both large and small injectors. Avoids costly delays and possible damage to engine. Also obtainable with Navy-approved gauge. Write for new bulletin.

Ideal for Testing Hydraulic Equipment

ADECO

AIRCRAFT & DIESEL EQUIPMENT CORPORATION
4401 N. RAVENSWOOD AVENUE
CHICAGO 40, ILLINOIS


AUTOMATIC
POWER
AS DEPENDABLE AS SUNUP
ENGINES with SYNCHRO-START AUTOMATIC CONTROLS
THE ROBOT SYNCHRO-START CONTROLS
Consult your Engine Manufacturer or Write
SYNCHRO-START PRODUCTS
221 EAST CULLERTON ST.
CHICAGO 16, ILLINOIS

# WANT TO GO SHOPPING ?

Old Dutch Cleanser would be 45¢
OLD DUTCH
Gillette Blue Blades would be $1.25 (pkg. of 5)
Arrow Shirts would be $11.20
Pro-phy-lac-tic Tooth Brushes would be $2.50
Luden's Cough Drops would be 25¢
Medicated
LUDEN'S MENTHOL COUGH DROPS
Pepsi-Cola would be 25¢
Wrigley's Gum would be 25¢
WRIGLEY'S SPEARMINT CHEWING GUM
Ivory Soap would be 50¢ (large size)
IVORY SOAP
PROCTER & GAMBLE
Listerine Tooth Paste would be $2.00
LISTERINE TOOTH PASTE

***What's happened to prices?*** It would be mighty unpleasant for our America to slide into a situation where you had to pay these prices for these familiar products. Of course, it wouldn't happen overnight. It would happen slowly, insidiously. That's the way it *is* happening.

Of course the greatest catastrophe wouldn't be just the higher prices of the familiar American products shown here. It would be the drop in the value of money. Your money in the bank would *shrink*. Your life insurance would be worth *far less*. Your pay check—well, you know what's happening to it already.

There are three ways we can stop this creeping, soul-destroying monster from taking America over. Read them carefully: 1—*Encourage* our representatives in Washington to tax our extra income away. (*Sure it's hard, but not as hard as Inflation, and saddling our children with the war's cost!*) 2—Give wholehearted support to Government price-control agencies. (*Sure they've made mistakes, but they're the best we have and they can do the job if we support them.*) 3—Get along on as little as you can. Deny yourself—to buy War Bonds. (*The suckers are the ones who are spending, not the ones who are saving. Think that through.*)

If you have the courage to do these three things, America can go right on being the America we've always known.

Have you . . .?

# ROGERS DIESEL AND AIRCRAFT CORPORATION

1120 Leggett Ave., New York 59, N.Y. Builders of diesel-electric equipment and aircraft parts for the armed forces. *Divisions:* Hill Diesel Engine Company, Edwards Company, Edwards Aircraft Products, Inc., Ideal Power Lawn Mower Company.

Diesel Engines, 5 to 2000 h. p. » Gasoline Engines » Generator Sets » Generators » Power Units Switchboards » Pumping Units » Hydraulic Aircraft Equipment » Recoil Mechanisms » Power Mowers Power Brushes » Snow Removal Equipment » Streamlined DeLuxe Railway Motor Trains » Diesel Locomotives

TRADE MARK REG.

A word of thanks to the famous American makers represented above, who have permitted us to associate their products with prices upped fivefold — an increase that is small, compared to what happened in inflated Germany, when a loaf of bread cost a million marks!

COMPLETE REPRINTS of this message for poster use will be supplied on request, subject to the limits of our paper allotment.

maintaining unusual production during the year, Mr. Lefebvre also paid tribute to the corporation's employees now in the armed services.

"It is always gratifying to know," he said, "that the thought uppermost in the minds of the men and women operating our plants and foundries is to turn out, at top speed, the engines and equipment needed for final victory.

"I appreciate that most of our fellow workers who are now in military service would like to know how we shall put to use the victory they are winning for us.

"Naturally, the final decisions regarding many of our plans, like those of other industries, depend upon the answers to some mighty important questions concerning problems such as taxes and reconversion to peace-time production. I'm quite confident, however, that given a political and economic environment which is favorable to the expansion of free enterprise, they can be sure that we will be able to give them what they'll need to enjoy the victory, just as we are now giving them what they need to win it."


"CHICAGO SCREW"
--the Outfit with the Know How!

O. D. OF HEAD GROUND CONCENTRIC WITH BODY AND THREADS.
UNDERSIDE OF HEAD GROUND SQUARE WITH BODY AND THREADS WITHIN 002" TOTAL INDICATOR READING.
BODY GROUND TO .0002" TOTAL TOLERANCE.
THREAD: PRECISION GROUND, MILLED OR ROLLED TO CLASS 3 FIT, CONCENTRIC WITH BODY.
WASHER FACE GROUND SQUARE WITH TAPPING WITHIN .004" TOTAL INDICATOR READING.
TAPPED TO CLASS 3 FIT.
CONNECTING ROD BOLT: Electric Furnace SAE 3140 Steel. Rockwell 31-36 "C" Scale.
CONNECTING ROD BOLT NUT: Heat Treated Alloy Steel. Working Face Hardened to 55-60 Rockwell "C" Scale.

When precision is important—remember "Chicago Screw", the outfit with the "Know How". Working to close tolerances is easy with us, because we have the experience, manpower and machinery, plus the "know how" to produce hundreds or millions of hardened and ground screw machine products for Diesel use—all to exacting precision standards.

All secondary operations such as Slotting, Milling, Drilling, Broaching, Hardening, Grinding, Thread Grinding, Thread Milling, etc. are handled within our own plant.

ARMY E NAVY

THE CHICAGO SCREW CO.
ESTABLISHED 1872
1026 So. Homan Avenue Chicago, Ill.


## Lady Loco Operator

*The ladies are running a number of the many Diesel-electric switching locomotives in service today, and doing a good job of it too! At the controls of this General Electric 45-tonner used at the Watervliet Arsenal, N. Y., is Mrs. Lydia A. Donnelly, recently honored with five other members of the fairer sex as an outstanding representative of American women in war work during the annual convention of the National Association of Manufacturers in New York City. (Official Watervliet Arsenal Photo.)*

## Purolator Products Elects Clarence E. Searle to Board

RALPH R. LAYTE, President, Purolator Products, Inc., announces the election of Clarence E. Searle to the Board of Directors. Mr. Searle is also Vice-President in charge of Sales and Member of the Board of Worthington Pump & Machinery Corporation.

Mr. Searle, a native of Ansonia, O., has been associated in the past with Western Electric Co., General Electric Co. and Allis-Chalmers Mfg. Co. He has been with Worthington Pump & Machinery Corporation since February 1932, and is now serving the War Production Board as an Executive Consultant on pumps and compressors to the Industrial Equipment Division.

Purolator Products, Inc., whose Board Mr. Searle now joins, is the originator and leader in design and production of Oil Filters for all types of internal combustion engines and is engaged 100% in the production of oil filters for jeeps, trucks, tanks, aircraft carriers and other types of ships, and for hydraulic systems on virtually all types of aircraft.

## New Method for Repairing Cracked Cylinder Blocks in 10 Minutes

A NEW technique for repairing cracked cylinder blocks has just been perfected by the Metallizing Company of America. The technique is so new and advanced that there is really no basis for comparison with the old-fashioned, pre-heating and welding methods with which 1½ days were ordinarily required to complete such a job.

Months of research and tests went into the development of this new process—one which promises to effect economies in money, materials and man-hours in hundreds of shops of bus and truck fleet carriers throughout America.

The new Mogul Electric Bonder is used to make the repair on cracked cylinder blocks in less time—and at far lower cost. Only pure nickel is used, no dopes or sealers are necessary. Cracks do not have to be pinned or sewed in any way. In fact repair jobs can be done from start to finish in as little as 10 minutes and blocks repaired by Mogul Electric Bonding are exchangeable.

The important feature of this revolutionary new process is the utmost simplicity with which a repair job is accomplished. There are just 4 easy steps:

1. The cylinder block is first chiseled with a cape chisel to remove and clean metal around the crack.
2. Using the Mogul Electric Bonder and the air-cooled electrode holder pure nickel is deposited in sufficient quantity to seal the crack.
3. After bonding, the surface is peened and Mogul Electric Bonder is then used again to deposit more metal and fill up any part of the cavity caused by the chiseling operation. The surface is then ground to the original tolerances.
4. The cylinder block is then ready for immediate service. In many cases the job can be completed in about 10 minutes.

Simplicity of construction and ease of operation are two important features of the Mogul Electric Bonder. Another feature of this unit is the Air-Cooled Electrode Holder which makes possible high speed bonding of the cracked block without any danger of the work becoming overheated, pre-hardened or distorted. It further eliminates the possibility of dirt or excess carbon getting into the work, which may have a tendency to give a false bond. The design of the nozzle permits ready adjustment of the electrode to any length.


A New PUMP

Demco
No. 2PB Fuel Injection Pump

With NEW Features

*Multiple-Unit*

*Self-Contained drive*

- The pump elements are removable upwards without the necessity of removing any other part of the pump.
- New pump elements slip into the pump housing without any special tool or adjustment in calibration.
- No necessity for removing pump from engine for servicing.
- Extreme ease in servicing. No special tools required.
- Pump is supplied with the simplest and most efficient fuel supply pump of ample capacity.
- Largest plunger, 12 mm. diameter.
- A modernly designed and made fuel injection pump.
- Interchangeable with other makes.

*Write for complete information.*

DEMCO

DIESEL ENGINEERING & MANUFACTURING CORP.
200-214 NORTH LAFLIN STREET • CHICAGO, ILLINOIS

The process has been tried and proven through repeated tests of all types. For those interested, The Metallizing Company of America has prepared an interesting four page folder which describes and illustrates the new Mogul Electric Bonder and outlines in graphic step-by-step-form the simple process of reclaiming cracked cylinder blocks by this new method as well as Bulletin No. 16 which shows in detail how this method of repair is accomplished.

You may obtain your copies of this interesting literature by addressing your request on company letterhead to Metallizing Company of America, 1330 West Congress Street, Chicago 7, Illinois.

## PESCO Advances Ed. S. Moreland

ANNOUNCEMENT is made by PESCO Products Co. (a division of Borg-Warner), of the advancement of Ed. S. Moreland to Assistant Sales Manager to direct field activities under the supervision of N. M. "Dutch" Forsythe, Vice-President in charge of sales. Mr. Moreland has had wide engineering and sales experience in previous assignments. PESCO is a leading manufacturer of precision hydraulics, fuel pumps, air pumps and related accessories for aircraft and also other industrial applications.

*Ed. S. Moreland*

Other recent personnel changes at PESCO, as confirmed by President R. J. Minshall, include the naming of Ed. M. Whalley as Works Manager, Louis Matthews as General Superintendent, Jay M. Roth as Director of Engineering for pump and automotive developments, and John A. Lauck as Chief Engineer of pump department.

## Rota-Sight Flow Rate Alarm

FOR visible and audible protection against dangerously low or high flows of liquids and gases Fischer and Porter has developed the new Rota-Sight Flow Rate Alarm. Valuable and critical equipment that can be ruined by failure of a cooling or lubricating flow, or a process or product that could be spoiled by excessive flows is said to be safeguarded with this new device.

The Rota-Sight Alarm operates through a float which moves up and down a pyrex tube into which triangular flutes have been fashioned. As the float rises, the area within the flutes increases, causing the float to assume a position in the tube in direct proportion to the flow rate. A magnetic extension on the float trips an external switch to operate the alarm circuit.

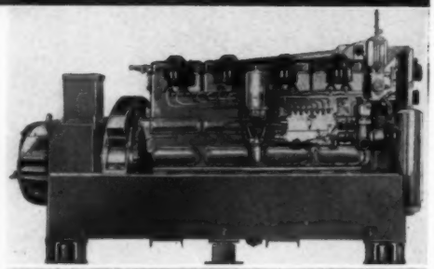
The Rota-Sight Alarm is used for flows of water, lubricating oils, filter feeds, overflows, chemical additives, etc. Bulletin 92-B, with full description will be sent to you gladly, upon request, by Fischer & Porter Company, 941 County Line Road, Hatboro, Pa.

*Emotionally or Mechanically

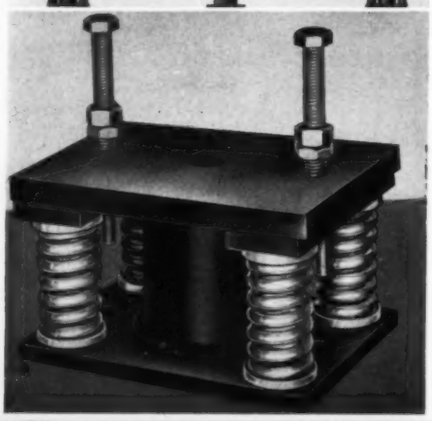
L.S.T. (Landing Ship-Tank) Official U. S. Navy Photo.

"Jitters" in man or machine sabotage efficiency and cause costly lay-ups.

Model GBDS Superior Diesel Engine Generating Unit of the National Supply Company. This 8 cylinder 8½" x 7" auxiliary equipment as installed aboard the Navy's L.S.T.s is mounted on 4 type SS/E Double Acting plus 2 Type SC/E Co-ordinated Korfund Shockproof Isolators.



Emotional CONTROL in our fighting forces is a product of training and experience—just as our elimination and CONTROL of vibration in machinery is the result of 40 years of scientific research gained from over a quarter of a million successful KORFUND VIBRATION CONTROL installations.

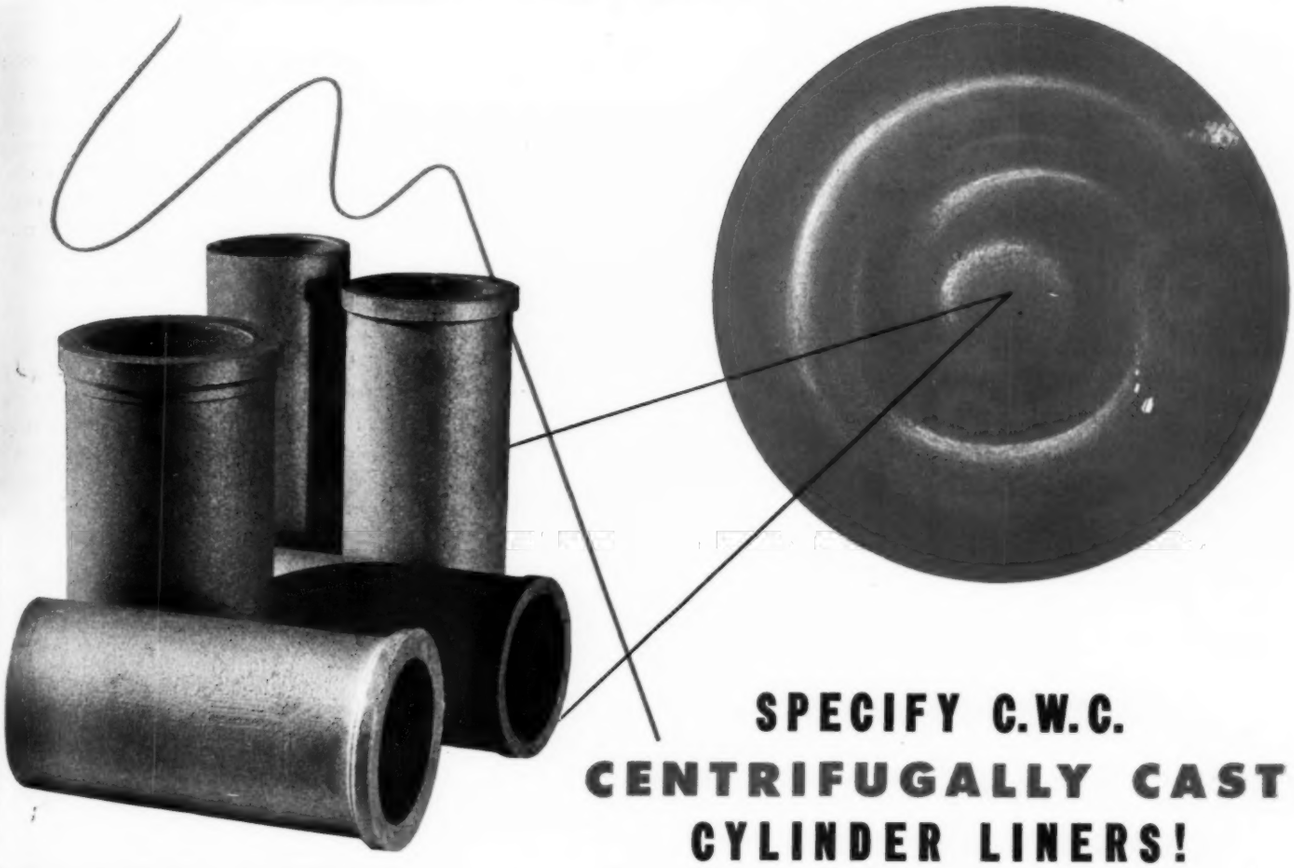


KORFUND VIBRATION CONTROL

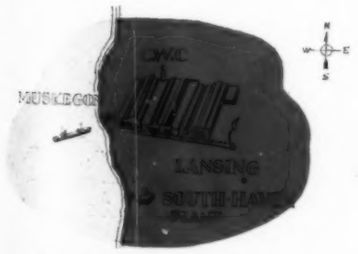
Korfund Double Acting Shockproof Vibro Isolators—Type SS/E.

THE KORFUND COMPANY, INC.
48-24 THIRTY-SECOND PLACE LONG ISLAND CITY, I, NEW YORK

# HOW TO RESIST CYLINDER WEAR AND CORROSION!



## SPECIFY C.W.C. CENTRIFUGALLY CAST CYLINDER LINERS!




**Campbell, Wyant & Cannon** foundries are located in Muskegon, South Haven (National Motor Castings Co.) and Lansing (Centrifugal Fusing Co.)
**Industry's Leading Contract Foundry Organization**

C.W.C. cylinder liners and sleeves metallurgically engineered of electric furnace metal, alloyed or unalloyed, cast centrifugally in permanent molds, possess these engineering and production advantages:

- **Excellent machinability with high Brinell**
- **Higher wear resistance due to density and uniformity of structure**
- **Corrosion resistance through the use of alloys**
- **Require no aging or seasoning because they stay put**

C.W.C. cylinder liners meet the most exacting requirements of engine builders in every field for equipment or replacement use in either wet or dry applications.

Consult C.W.C. engineers and metallurgists about your volume casting production problems.

## CAMPBELL, WYANT & CANNON FOUNDRY CO.

**MUSKEGON, MICHIGAN**

## Century of Engine Building Progress Depicted in New Cooper-Bessemer Motion Picture

A NEW industrial film of unusual historic and educational value, just released by The Cooper-Bessemer Corporation, traces the development of the firm's engine production from its humble beginning 110 years ago to its present position as a leading producer of Diesel and gas engines, compressors and foundry castings.

Produced by a nationally known industrial film concern, the film entitled, "Continuous Performance," skillfully blends important occurrences and dates in history with the significant advances made by the company in supplying the fast-growing power needs of the nation.

From a "one horse power" foundry which marked Cooper-Bessemer's beginning at Mount Vernon, Ohio, in 1833, the production takes you up through the years of industrial progress, portraying the firm's transitional period covering the manufacture of plows and saw mill machinery, steam power units which included the famous Corliss steam engine, the first blowing engine for a blast furnace, the first railroad engine west of the Alleghenies, and other important achievements which have and still are contributing much to the growth of the country.

Sustaining interest is maintained through the latter part of the film as it carries the viewer on what virtually amounts to a personally conducted tour of Cooper-Bessemer's two plants, the trip covering practically every department and operation involved in the design, construction and performance of the large internal combustion engines which are the company's principal products.

According to individuals who have seen the film in special preview showings, "Continuous Performance" not only presents a dramatic picture of efficient engine manufacture, but also emphasizes the extreme importance of Diesel and gas engines, electrical generating sets and compressors for industrial and marine purposes during normal times as well as in periods of national emergency.

The motion picture is now being scheduled by Cooper-Bessemer for extensive showing throughout the country so that Government officials, engineers, students, and present and future users of Cooper-Bessemer products may obtain a better understanding and knowledge of the company, its policy, facilities and the application of its engines for the various power requirements for which they were designed.


AMERICA'S ONLY RADIAL AIR-COOLED DIESEL ENGINE

SAFE LIGHT WEIGHT DIESEL POWER

- No Fire Hazard
- Lower Fuel Consumption
- Increased Striking Range
- Greater Stamina
- Dependable Operation
- Instant Response to the Throttle
- No Ignition System
- Lower Cost of Fuel
- Constant Torque at All Speeds
- No Radio Interference

FOR TANKS • FOR PLANES • FOR SHIPS

Using fuel that will not burn even when exposed to open flame, the Guiberson completely eliminates the usual fire hazard from the power plants of tanks, planes and ships, and there is no ignition system to cause sparks or interfere with radio operation. Weighing less than two pounds per horsepower, the new light weight Guiberson diesel hits harder, faster, farther. Safe and dependable, Guiberson powered equipment is hitting the Axis on the battle lines of the world and is ready to serve on land, sea and in the air.

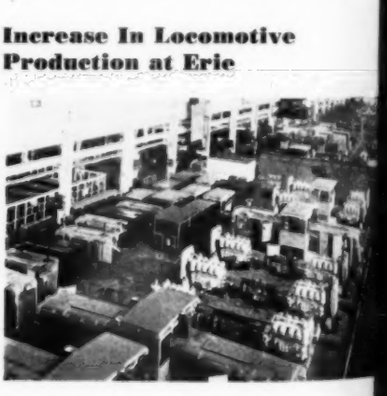
Guiberson U.S.A.

ESTABLISHED 1919

GUIBERSON DIESEL ENGINE COMPANY
Dallas, Texas

THE GUIBERSON CORPORATION
*Aircraft and Heater Division*


## Increase In Locomotive Production at Erie



*Locomotive assembly floor in the Erie plant of G-E, showing 44-ton Diesel-Electrics in various stages of assembly.*

PART of the record breaking totals piled up for General Electric's Erie Works during the latter part of 1943 is this group of 44-ton Diesel-electrics shown in various stages of assembly on the locomotive assembly floor. Shipment of Erie-built Diesel-electric locomotives during 1943 totaled 309: 33 to domestic railroads and

276 to industrial plants all over the nation. Moreover, the Erie Works built and shipped industrial electric locomotives of various types, and many electric mining locomotives. Heightened production was made possible by an increase in government allocations and was achieved through standardization and planned production.

## Aircraft Engines of the World, 1944

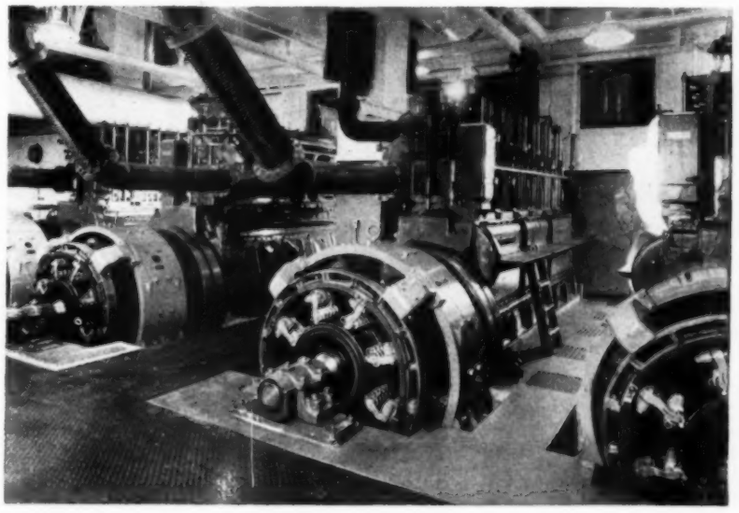
THE new 1944 edition of the international reference book, "Aircraft Engines Of The World," by Paul H. Wilkinson, has just been announced. The new edition of this reference book contains standardized data pages (in English and metric) with full page illustrations of 130 of the latest aircraft engines including ten of the new airborne auxiliary engines. Also included are condensed data on 275 models of these basic power plants. Separate sections of the book are devoted to the aircraft engines of the United States, France, England, Germany, Italy and Japan. Specifications of the Guiberson, Daimler-Benz and Junkers aircraft Diesels are included. There are 142 illustrations, a total of 320 pages, size 6 in. x 9 in.; price $8.50 postpaid. Order from DIESEL PROGRESS.

## R. W. Owens Joins Elliott

R. W. OWENS has been appointed assistant to the president of Elliott Company, according to announcement by Grant B. Shipley, president of the firm.

*R. W. Owens*

a native of Morris, Illinois, and a graduate of the University of Illinois with a B.S. degree, Owens received an M.S. degree from the same university in 1915 before joining the staff of Westinghouse. Successively a section engineer,

*Seven years without a shutdown*

. . . a tribute to sound management and maintenance

*Type RT switchboard type, capacity up to 28 circuits. Many other types available.*

The four Worthington Diesel engine-generator sets at 2 Park Avenue Building, New York, have now completed seven years of continuous operations, without a shutdown or major repair. Careful planning and careful maintenance have kept this equipment in regular service throughout this period. One of the aids to such reliable operation is the installation of Alnor Exhaust Pyrometers. The constant check of exhaust temperatures with the Alnor Pyrometer gives the operating engineer a guide to continued high-efficiency operation and an easy means of checking adjustments and maintenance.

Alnor Exhaust Pyrometers are built in a complete range of sizes and types, single and multi-point, to meet the needs of any type of engine, large or small. Write for Bulletin 2819.

**ILLINOIS TESTING LABORATORIES, INC.**

**420 North La Salle Street**

**Chicago 10, Illinois**

manager of the industrial motor engineering department, general manager of industrial engineering, and manager of the motor division in complete charge of engineering, manufacturing and sales, he brings to Elliott Company 28 years of practical design experience.

A member of the American Institute of Electrical Engineers, Owens also belongs to the University and Edgewood Country Clubs of Pittsburgh, and makes his home at 217 Beech Street. He is married and has one son.

## Marley Company Establishes Divisional Headquarters At Houston

THE Marley Company announces personnel shifts resulting from raising its Houston office to the status of a divisional headquarters under the direction of Ray T. Jenkins who formerly headed the Tulsa division.

The company is now represented in the Tulsa area (all of Oklahoma, western Arkansas and the Texas panhandle) by Walter S. Smith and his Process Equipment Company. Mr. Smith, a resident of Tulsa for more than six years, is well-known throughout the territory as an applications engineer for heat transfer equipment.

From the main office, Joe T. McKinley has joined the Houston staff. The Kansas and western Missouri area is now handled by R. H. Ahrens out of the company's headquarters.

## 1943 Editorial Index Now Available

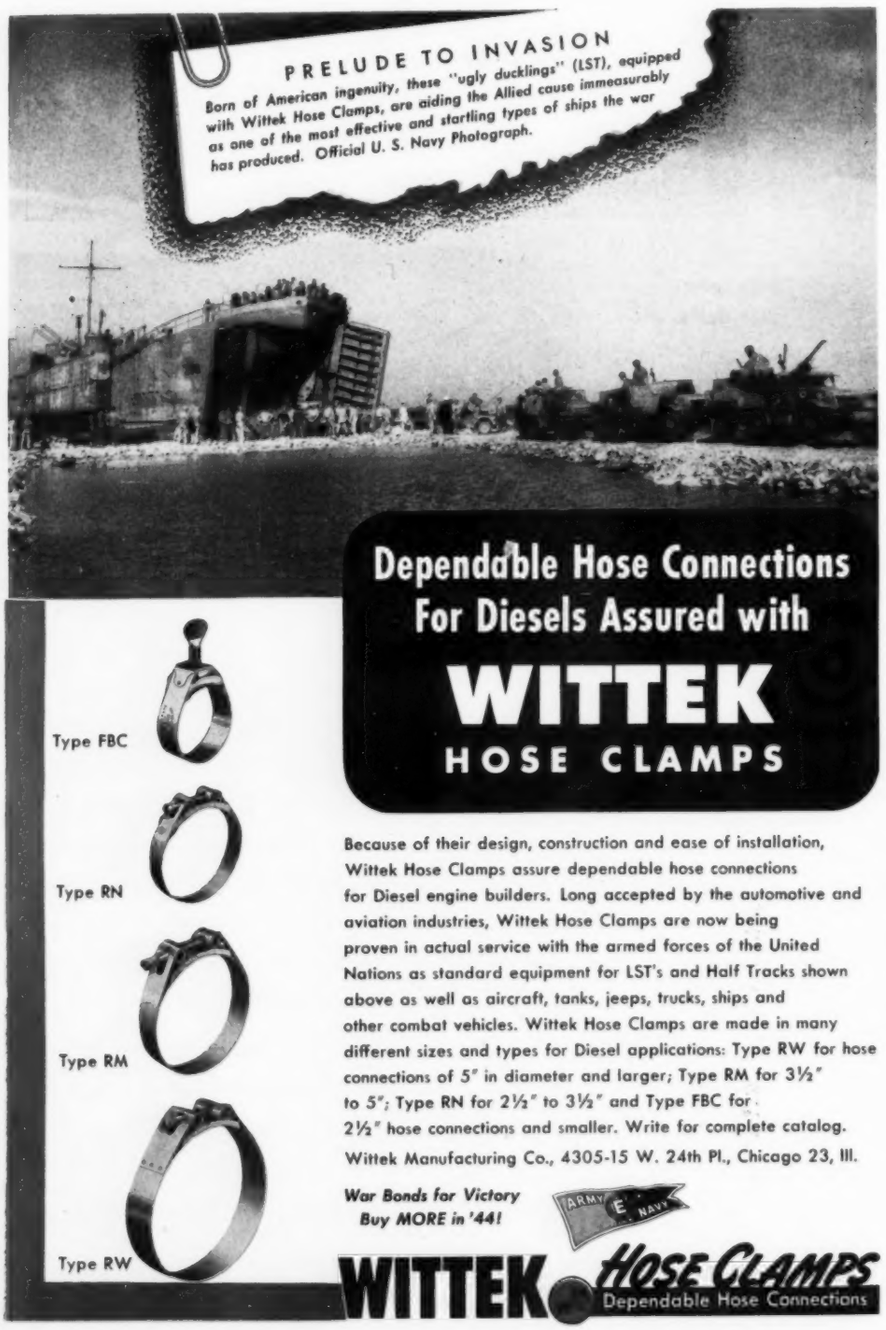
A COMPLETE index of all articles and editorial material with a cross index of authors which appeared in the 1943 issues of DIESEL PROGRESS is now available. Copies of this ten-page index will be mailed upon request without charge. Write direct to DIESEL PROGRESS, 2 West 45th Street, New York 19, N. Y. for your copy.

## Weatherhead Creates New Vice Presidential Posts

TWO new vice-presidential posts at the Weatherhead Company, were recently announced by A. J. Weatherhead, Jr., president of the firm. The newly created position of executive vice president will be filled by H. I. Lewis, Hartford, Conn., an official of the American Hardware Company. Henry F. Bailey, Cleveland banker, will take over the position of vice president in charge of finance.

*H. I. Lewis, executive vice president, The Weatherhead Co.*

H. I. Lewis brings to his new duties a wide manufacturing and executive experience as vice president, director and a member of the executive committee of American Hardware, and as general manager of the Corbin Screw Products Company, a subsidiary. A graduate of Massa-



PRELUDE TO INVASION
Born of American ingenuity, these "ugly ducklings" (LST), equipped with Wittek Hose Clamps, are aiding the Allied cause immeasurably as one of the most effective and startling types of ships the war has produced. Official U. S. Navy Photograph.
Dependable Hose Connections For Diesels Assured with
WITTEK
HOSE CLAMPS
Type FBC
Type RN
Type RM
Type RW
Because of their design, construction and ease of installation, Wittek Hose Clamps assure dependable hose connections for Diesel engine builders. Long accepted by the automotive and aviation industries, Wittek Hose Clamps are now being proven in actual service with the armed forces of the United Nations as standard equipment for LST's and Half Tracks shown above as well as aircraft, tanks, jeeps, trucks, ships and other combat vehicles. Wittek Hose Clamps are made in many different sizes and types for Diesel applications: Type RW for hose connections of 5" in diameter and larger; Type RM for 3½" to 5"; Type RN for 2½" to 3½" and Type FBC for 2½" hose connections and smaller. Write for complete catalog.
Wittek Manufacturing Co., 4305-15 W. 24th Pl., Chicago 23, Ill.
War Bonds for Victory
Buy MORE in '44!
ARMY E NAVY
WITTEK HOSE CLAMPS
Dependable Hose Connections

chusetts Institute of Technology with a degree in mechanical engineering, Lewis was formerly associated with the Seybold Division of Harris-Seybold-Potter, and with American Type Founders. He is married, and has two children.

*Henry F. Bailey, vice president in charge of finance, The Weatherhead Co.*

Henry F. Bailey has been with the National City Bank of Cleveland for seven years as loan officer and vice president, and is already a director of the Weatherhead Company. Bailey was formerly associated with the Federal Reserve Bank and with Lockwood Greene Engineers, management and consulting firm. A registered professional engineer, he lives at 2779 Derbyshire Road, Cleveland. A native of Waterbury, Conn., Bailey was graduated from the University of Vermont in 1915 with a degree in civil engineering. He is married and has two children.

Other officials of the Weatherhead Company are John R. Cox, vice president in charge of manufacturing, and E. L. Ferguson, treasurer. John W. Reavis of the law firm of Jones, Day, Cockley and Reavis is company secretary.

## West Coast Diesel News

*By* JIM MEDFORD

RESUMPTION of tuna boat construction is headed by the San Diego, California, yard of Campbell Machine Co., the 143-foot *Endeavor II* for Joe Monise; main engine 900 hp., auxiliaries, two 200 hp., all Union Diesels.

AT Harbor Boat Works, San Diego, for an unannounced owner, a 112-foot tuna clipper is under way, her main engine a 450 Enterprise Diesel with a pair of Caterpillar Diesels as auxiliaries—refrigeration and generation.

ANOTHER Harbor Boat Works job is the 48-foot *Josephine* for a San Diego fisherman. Of vee-bottom design and 16 tons, she will be propelled by a four-cylinder, 75-hp. Caterpillar Diesel.

THE San Diego yard of the Lynch Shipbuilding Company will install an Enterprise six-cylinder, 400-hp. Diesel in the 96-foot *West Coast* for John Ghio. Auxiliaries are Caterpillar Diesels.

SAN FRANCISCO Bay area is coming right along with the recently launched *Duchess* by George Knease Company for Verne Taratino. Powered with a 5-cylinder, 200-hp., Fairbanks-Morse Diesel, she includes a set of Exide batteries.

AT the San Francisco yard of the Martinolich Company the 87-foot *Fleetwood* of the unusual vee-bottom type for this size ship is powered with a pair of V-8 Caterpillar Diesels of 135 hp., with Twin Disc clutches and chain drive.

ON the Oakland side, the Lorimer Diesel Engine Company reports installations of Lorimer Diesels in two new Army Engineer barges, both

THE dependability of a Diesel engine is no better than the dependability of its starting. That is why so many operators with electric starting Diesels look to Globe Spinning Power Batteries with Perma-Set plates for long, uniform, unfailing performance. A Globe engineer will be glad to analyze your needs—without obligation. Write nearest factory.

**GLOBE-UNION INC. • *Milwaukee 1, Wisconsin***

ATLANTA • BOSTON • CINCINNATI • DALLAS • KANSAS CITY
LOS ANGELES • MEMPHIS • MINNEAPOLIS • PHILADELPHIA • SEATTLE

DP-444

225 hp., driving 150-kw. generating sets.

IN the Pacific Northwest at Seattle the trawler *Rosalie* has been repowered by the Whiz Fish Products Company with a 165-hp. Gray Diesel using a Twin Disc 3 to 1 reduction gear.

IN Vancouver, B. C., the Nootka Packing Company has installed twin Murphy Diesels of 100 hp., in a 73-foot seiner building in their yard at Port Albion, B. C. Drive is to single propeller.

THE new 65-foot fish boat under construction at Garniner, Oregon, for Captain Neal Burton will have Caterpillar Diesels—135 hp. for propulsion and a 20-hp. generator set.

PORTLAND, Oregon, fishing fleet has another Caterpillar Diesel craft, the 55-foot halibutor, *Mylark* for Captain Barnes. Trials with her 100-hp. engine showed a speed of nine knots.

ANOTHER Seattle, Washington, fish boat to get Gray Diesels is the 72-foot *Shelikof* by the Grandy Boat Company for Lee Wakefield. Engines are 165 hp. each and have Twin Disc gears.

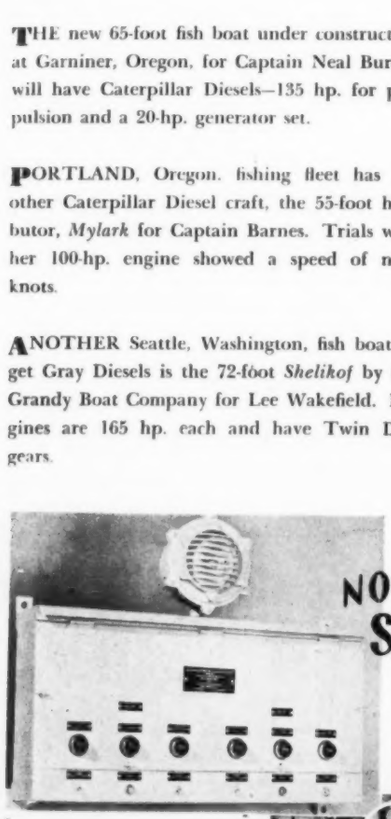
SWITCHING from fish to war we have the 187-foot salvage craft *Lincoln Salvor* by the Bellinham Marine and Boatbuilding Co., for the British government powered with four six-cylinder, 10½ by 13½-inch Cooper-Bessemer Diesels.

TILLAMOOK, Oregon, yards of the Steinbach Iron Works have completed the 65-foot Maritime Commission tug *Port Stonewall* with her 250-Superior Diesel and its 2 to 1 Twin Disc gears.

ALASKA is building, too; the Ketchikan-built 70-foot seine boat for Captain Jack Breskovich will be powered with a 150-hp. Atlas Imperial Diesel.

CONSTRUCTION at the Ballinger Boat Works, Seattle, Washington, is under way of a 70-foot seiner for the Hall Brothers of Newport, Oregon. The main engine is a 175-hp. Cummins Diesel.

BRITISH Columbia yards are busy on commercial vessels: the A. C. Benson yard at Vancouver has installed a 100-hp. Caterpillar Diesel in their new 53-foot tug for the Keech Towing Company.

NO NUISANCE SIGNALS

The system is entirely automatic and does not depend upon manual operation of switches. In other words, no running back and forth to push buttons on the panel.

It permits the engine to be maneuvered at will without sounding an alarm. The only time the alarm will sound is when the engine is running and a lube or water temperature failure takes place.

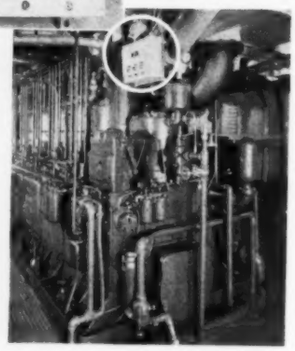
The moment the engine is started, regardless of the RPM or maneuvering conditions, the BROWN AUTOMATIC ALARM SYSTEM immediately protects the engine.

BROWN AUTOMATIC ALARM SYSTEM

for Diesel Engines

Absolute Protection Against Lube Oil or Water Temperature Failure

Used on Maritime Commission, Army Transportation Corps, Coast Guard, Bureau of Ships Vessels.



Installation aboard Tug "Duke"

Send for our Bulletin No. 10

"BROWN AUTOMATIC ALARM SYSTEMS"

Manufactured by

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NEW tuna clippers with Diesel propulsion continue with the Lynch Shipyard, San Diego, California, pushing along a 96 footer with an 8-cylinder, 525-hp. Enterprise; Manuel Rosa.

AT the Campbell Machine Company's yards, San Diego, the new 143-foot clipper for Joe Monise will have a pair of Union Diesels turning 125 kw. generators: main engine 850 hp. Superior.

AT Newport Harbor, California, the Ackerneer Corps. Main engine is a 550 hp. Cooperman Boat Yard has completed a 96 foot combination tug and freighter for the U. S. Engi Bessemer.

FELLOWS and Stewart, Terminal Island, California, recently launched one of the Navy subchasers with twin General Motors pancake Diesels rating 1200 hp. at 1800 rpm.

THE Long Beach, California, yard of Hodgson-Greene-Haldeman have under construction the 95-foot *Viking II* with 300 hp. Superior Diesel and a pair of Superior Diesel 100 hp. auxiliaries.

AN additional Hodgson-Greene-Haldeman job is the 110-foot *Liberty* for Frank Gonsalas. She will have a 475 hp., 12 by 15 Enterprise Diesel later to be supercharged. Pumps are by Fairbanks-Morse.

THE old-time yard of Al Larson, Terminal Island, California, are building for Elmer Duzich an 85-foot seiner to be driven by a 320 hp. Atlas Imperial Diesel.

AT the Fraser River Boat Works, South Westminster, a 55-foot halibutor for Howe Sound Marine Service is having installed a new Murphy Diesel of 100 hp.

ANOTHER Vancouver yard, the General Boat Company, is repowering the Oliver Jones' *Wichmann* with a six-cylinder, 280-hp. Kermath Diesel using a Walter reduction gear of 4.6 to 1.

TO return to the South, we find that the Lynch Shipbuilding Co., of San Diego, will install a total of five Caterpillar Diesels in the ex-schooner *Louise* now cut down to a barge.

NEWPORT Bay's (California) Johnny Norek is getting himself another *Erm Too* with the able assistance of Wife Erma. This is the third fish boat they have built and their 60-footer will go to sea with a 115 hp. Caterpillar Diesel.

PERSONALITIES should have a place in this column and we would like to point out that

John Dickson, chief engineer of General Motors Diesel Engine Division, was a recent visitor to the three West Coast states in company with S. O. Jules, P. C. Representative for Gray Diesels.

AND Canada has not lacked for a well-known engine man to visit her west coast—F. W. Miller, president Canadian-Fairbanks Morse Co. Ltd., recently spent time in Vancouver and other B. C. cities. His headquarters are in Montreal, Quebec.

BUDA Company's Phil Howe of the Pacific Northwest territory was a five-week visitor to the Harvey, Illinois, plant where he completed a special service course in Buda Diesel engines and then returned to God's country.

## Van der Horst Appoints H. P. Munger

APPOINTMENT of H. P. Munger as plant manager at Olean, New York, of two of the plants of the Van der Horst Corporation of America was announced today by Hendrik van der Horst, president of the concern which processes cylinders of internal combustion engines with a special porous chromium to give them four to twenty times longer life.

*H. P. Munger*

Before taking over his present responsibilities, Mr. Munger was superintendent of the new electrotinning plant of Republic Steel at Niles, Ohio. He supervised development of the electrotinning process there, having been transferred from the former Republic plant at Monroe, Michigan, where he was superintendent of electroplating.


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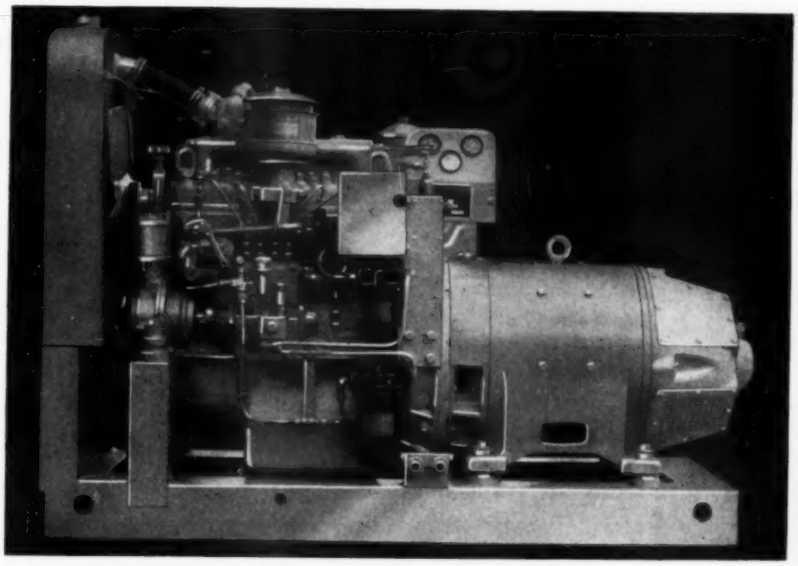

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Mr. Munger joined Republic Steel in 1936 and became assistant chief metallurgist at the Warren, Ohio, plant. Prior to that he had been with American Rolling Mills, beginning in 1929 as a research engineer and later becoming assistant business manager of the research laboratory.

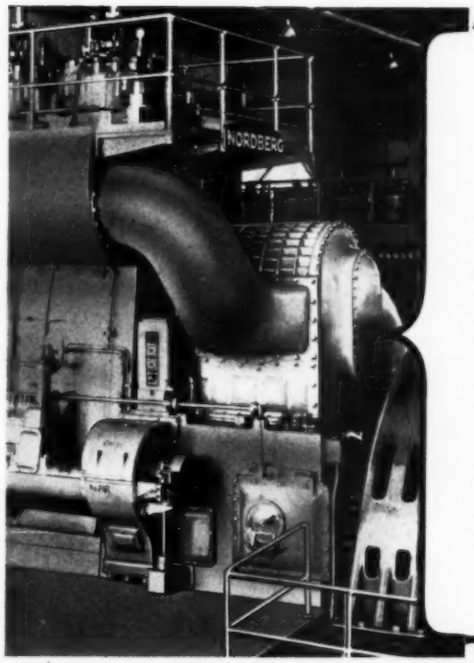
Graduated as a chemical engineer from Georgia Tech in 1925, he acquired his master's degree in that field from Columbia University and, for a time, was a Research Fellow at Mellon Institute. In 1929 he received his Ph.D. in physical chemistry from the University of Pittsburgh.

### Damon de Blois Wack

DAMON DE BLOIS WACK, executive vice-president of National Bearing Metals Corporation, died of virus pneumonia at St. Louis, February 1, 1944, after a brief illness. He was born in New York City in April, 1907 and was graduated from Yale in 1929.

*Damon de Blois Wack*

He belonged to the St. Louis Racquet Club and Mr. Wack joined the American Brake Shoe Company in 1934, and in 1939 was made vice-president of Brake Shoe's Pacific Coast Division. In October, 1941 he was transferred to National Bearing Metals at St. Louis, a Brake Shoe subsidiary, and was elected executive vice-president a year later. He was also a member of the W.P.B. Non-Ferrous Foundry Advisory Committee and a member of the Board of Directors of the Mercantile Commerce Bank of St. Louis. The St. Louis Country Club.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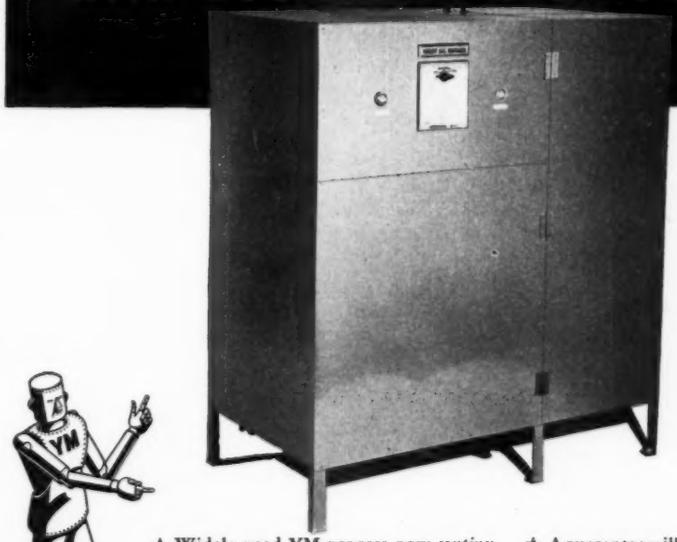

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## Fairbanks-Morse Presents Trophies For 1943 Sales Achievement

ROGER M. MURRAY, Manager of the San Francisco Branch of Fairbanks, Morse & Co., was recently presented with the President's Cup by Colonel Robert H. Morse, the company's chief executive, at a dinner at the Hotel Sir Francis Drake in San Francisco. It was eleven years ago that Colonel Morse first presented a trophy to his branch house organization who had the largest volume of business in relation to its annual quota.

*The above picture was taken immediately after the President's Cup was presented to Roger M. Murray, Manager of our San Francisco Branch, by Colonel Robert H. Morse, President, Fairbanks, Morse & Company. From left to right are F. James Bennett, San Francisco's Honor Field Engineer; George M. Niven, formerly Manager of the Seattle Branch House and now Manager of the Montreal Branch of the Canadian Fairbanks-Morse Company, Ltd.; Colonel Robert H. Morse, President; Roger M. Murray, Manager, San Francisco Branch; R. H. Morse, Jr., General Sales Manager; H. W. Brown, Manager, Los Angeles Branch; and Henry J. Barbour, Manager, Sales Promotion.*

Several days following the President's Cup presentation at San Francisco, the third place bronze plaque for 1943 sales achievement was presented the Seattle sales organization at a dinner at the Olympic Hotel in Seattle, Washington. Here the presentation was made on behalf of Colonel Morse by Mr. Barbour to George Niven, former Manager of the company's Seattle Branch and recently appointed Manager of the Montreal Branch of the Canadian Fairbanks-Morse Co., Ltd., Montreal, Canada. Other notables at the Seattle ceremony were John F. Marquitz, the newly appointed Manager of the Seattle organization, and W. F. Campbell, honor field engineer.

A silver plaque for second place in the company's 1943 contest was also presented to T. W. Drennen, Manager of the New York Branch, by R. H. Morse, Jr., General Sales Manager. At this ceremony other Chicago officials in attendance were L. A. Keeler, Vice President and Comptroller, and A. E. Ashcraft, Vice President in Charge of Manufacturing.

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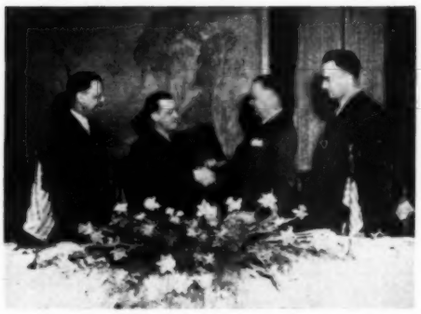

*Henry J. Barbour, Manager, Sales Promotion, on behalf of Colonel Robert H. Morse, President, and R. H. Morse, Jr., General Sales Manager, presented the third place award for sales achievement consisting of a bronze plaque to George M. Niven, outgoing Manager of the company's Seattle Branch House. This event took place in the Olympic Hotel on the evening of Monday, January 31, 1944. Looking on at the left is John F. Marquitz, now Manager of the Seattle Branch, and at the right, W. F. Campbell, Seattle's Honor Field Engineer.*

### New British Armored Car Sets Mark in Fire Power

LONDON, March 20—The British announced today that they had developed a twelve-ton armored car equipped to fire an anti-tank six-pounder while rumbling along from eighteen to forty-two miles an hour.

Called the "EAC Armored Car Mark II," the radio-equipped vehicle also mounts machine guns. The crew of four is protected by armor plate an inch and a quarter thick at the front and one inch at the sides.

Described as the "biggest, most powerful British armored car yet seen in service on any battle front," it is powered with a Diesel engine. *Associated Press Release.*

### Gas Turbines and Jet Propulsion

THE veil of mystery which has surrounded the jet-propulsion plane since it was recently officially announced in a joint communique of the Royal Air Force and the U. S. Army Air Forces—was partly lifted with the publication of "Gas Turbines and Jet-Propulsion for Aircraft," by G. Geoffrey Smith. **Price $1.50.**

The 80 page volume makes an exhaustive study of the jet-propulsion systems. Seventy-three detailed drawings and photographs show the development which has been made.

G. Geoffrey Smith, the internationally known Managing Editor of "Flight" and "Aircraft Production," in London; is a recognized authority on jet 'planes. He is a member of the Order of the British Empire.

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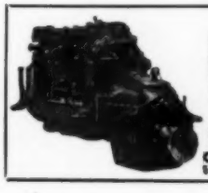

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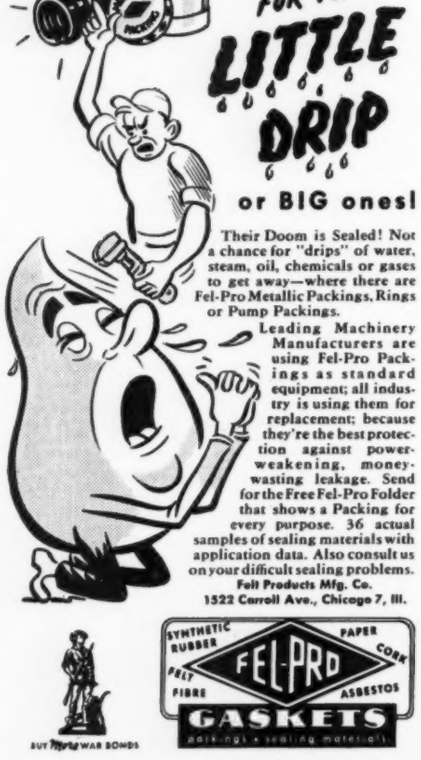
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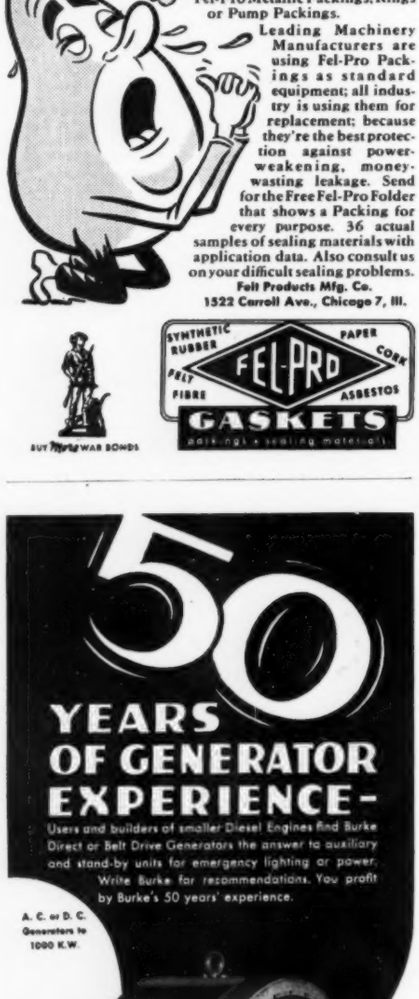
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## New Corporation to Build and Service 17.6 Laboratory Research Engines

ANNOUNCEMENT was made as of January 1, 1944 of the establishment of Laboratory Equipment Corp., Mooresville, Indiana, for the purpose of building and servicing the 17.6 Laboratory Research Engine. The three principals of the new corporation, Ralph E. Morgan, Lee Oldfield and Clarence M. Wetzel will devote their collective abilities to the above program for the duration, the announcement states.

## Crocker-Wheeler Division Appoints Lyman D. Warner

LYMAN D. WARNER, Assistant Sales Manager of the Crocker-Wheeler Division, Joshua Hendy Iron Works, Ampere, New Jersey has been appointed successor to C. F. Poirier, Sales Manager and Assistant Vice President.

*Lyman D. Warner*

Mr. Warner is well qualified for his new position, having been associated with Crocker-Wheeler's sales department and active in the sales of electric motors, generators and flexible couplings since 1937. Prior to his connection with Crocker-Wheeler he was associated with the Ingersoll Rand Company and the General Electric Company.

## 1943 Bound Volumes For Sale

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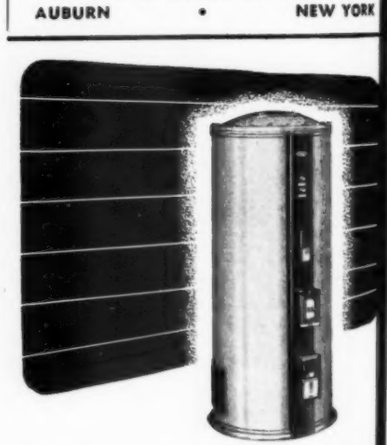

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## Lt. Comdr. F. S. Hodgman Appointed by Sperry Gyro

F. S. HODGMAN, Lieutenant Commander USNR, retired, assistant chief engineer of the Sperry Gyroscope Company, has been named manager of the Marine Division, it is announced by R. E. Gillmor, president. The new Division, which will absorb the company's Sperry plant in Brooklyn, has been established to develop a unit for the efficient manufacture of all products for naval and merchant ships, other than ordnance equipment, and for initiation of new developments and product improvements in the marine field.

A native of Nebraska, Hodgman attended the University of Nebraska and the U. S. Naval Academy. He served on the U.S.S. *Utah* during World War I, attached to Admiral Rogers' advanced base battleship division. Joining the Sperry organization in 1919 as product engineer on the gyro-compass. Hodgman contributed to the development of the gyro pilot for ships and airplanes and automatic ship controls for merchant and naval vessels. He was promoted to manager of product engineering in 1940, named manager of Sperry's new Nassau plant in January, 1942, and was made assistant chief engineer in July, 1943.

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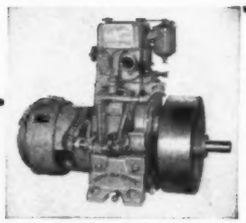

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